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THE GREAT LAKES PROGRAM

[HEAR]ING

[BEFORE] THE

SUBCOMMITTEES ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF AND ENVIRONMENT AND NATURAL RESOURCES

OF THE

COMMITTEE ON MERCHANT MARINE AND FISHERIES HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

ON

OVERSIGHT OF THE GREAT LAKES PROGRAM AND ITS APPLICABILITY TO OTHER REGIONAL PROGRAMS

MARCH 24, 1994

Serial No. 103–98

Printed for the use of the Committee on Merchant Marine and Fisheries

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THE GREAT LAKES PROGRAM

THURSDAY, MARCH 24, 1994

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF JOINT WITH THE SUBCOMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES COMMITTEE ON MERCHANT MARINE AND FISHERIES,

Washington, DC.

The Subcommittees met, pursuant to call, at 10:08 a.m., in room 1334, Longworth House Office Building, Hon. Solomon P. Ortiz [chairman of the Subcommittee on Oceanography] presiding.

Present: Representatives Ortiz, Green, Laughlin, Hughes.

Staff Present: Sue Waldron, Press Secretary; Robert Wharton, Senior Professional Staff; Sheila McCready, Staff Director; John Aguirre, Staff Assistant; Terry Schaff, Professional Staff; Katie Hornbarger, Sea Grant Fellow; Lisa Pittman, Margherita Woods, and Dave Whaley, Minority Professional Staff; and Richard Russell, Minority Counsel.

OPENING STATEMENT OF HON. SOLOMON P. ORTIZ, A REPRESENTATIVE FROM TEXAS, AND CHAIRMAN, SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF

Mr. ORTIZ. The hearing will come to order. Good morning. I would like to welcome all of you here today on behalf of the Subcommittee on Oceanography, Gulf of Mexico, and the Outer Continental Shelf, and the Subcommittee on Environment and Natural Resources.

Today, the Subcommittees meet to discuss the Great Lakes Program and the use of it as a model for other regional bodies of water, including the Gulf of Mexico. The Great Lakes Program was established in 1978 and formally authorized by Congress in 1987. The resulting EPA Great Lakes National Program Office was created to coordinate Federal and State efforts to regulate activities that pollute the Lakes.

In 1989, EPA Region 5 began the Great Lakes Initiative, a process aimed at developing uniform water quality standards for the eight Great Lakes States. The Critical Programs Act of 1990 established deadlines for the Initiative. Finally, last year, EPA published its proposed uniform standards for the Great Lakes basin in the form of the Great Lakes Water Quality Guidance.

The focus of this hearing is twofold. First, the Subcommittee would like to hear about how the Great Lakes Program has progressed; the rationale for its creation; how the Great Lakes Initia-

tive and last year's EPA Guidance were developed; what the benefits, costs, and impacts of the Guidance's implementation will be; and whether the Program is correctly focusing its efforts.

Second, the Subcommittees would like to hear about how the Great Lakes Program may serve as a model for other regional programs. As we heard in testimony presented before the Subcommittee during two separate hearings last year, the Gulf of Mexico is experiencing problems of its own which must be addressed while still preserving the economic viability of the Gulf area.

Several legislative proposals have been introduced this Congress to formally establish a Gulf of Mexico Program. The question is whether an EPA-led initiative like the Great Lakes Program and the resulting Water Quality Guidance is a suitable model to address the environmental and economic needs of other bodies of water like the Gulf of Mexico.

Ultimately, any program established to protect the Gulf must enhance coordination between the Federal Government, States, users of the Gulf, and the people who inhabit its shores. As such, I am very interested in hearing whether alternative approaches to those employed in the Great Lakes may better serve this purpose.

We have gathered an extensive cast of witnesses here today to provide comment on these issues. I welcome you all and look forward to hearing your testimony.

Mr. ORTIZ. I would like at this moment, and I know that some of the members might come in later on, to include the statements of those members who are not here this morning, and hearing no objection, so ordered.

[Statement of Mr. Weldon follows:]

STATEMENT OF HON. CURT WELDON, A U.S. REPRESENTATIVE FROM PENNSYLVANIA, AND RANKING MINORITY MEMBER, SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF

Let me begin by thanking Chairman Ortiz and Chairman Studds for holding this hearing on the Environmental Protection Agency's (EPA) Great Lakes Program.

This hearing is a prelude to the likely inclusion of a Gulf of Mexico Program in the reauthorization of the Clean Water Act. In examining the Great Lakes Program, hopefully our two Subcommittees can gain some insight into an appropriate structure for a Gulf of Mexico initiative.

Coming from the Great Lakes State of Pennsylvania, I recognize the resource's tremendous economic and ecological value. Combined, the Great Lakes not only support a half-trillion dollar economy, but are one of this continent's most important ecological features. They are the single largest system of freshwater lakes in the world, accounting for almost 20 percent of the earth's surface water.

Efforts to protect this valuable resource began shortly after the turn of the century with the signing of the Boundary Waters Treaty between the United States and Canada. These efforts continue today with the consideration of EPA's Great Lakes Water Quality Guidance which, once finalized, will set minimum water quality standards and antidegradation policies for the Great Lakes.

Although the Gulf and the Great Lakes are very different ecosystems, I believe that by hearing from our panelists today, the Subcommittees will be in a better position to craft a constructive program for the Gulf of Mexico. I look forward to working with my distinguished friends from Texas, Chairman Ortiz and Congressman Fields, in designing a regime to protect the Gulf.

[Statement of Mr. Fields follows:]

STATEMENT OF HON. JACK FIELDS, A U.S. REPRESENTATIVE FROM TEXAS, AND RANKING MINORITY MEMBER, COMMITTEE ON MERCHANT MARINE AND FISHERIES

Chairman Ortiz and Chairman Studds, thank you for convening this hearing on the Environmental Protection Agency's Great Lakes Program.

While it will be interesting to hear how our northern neighbors manage their international waters, I caution against using the Great Lakes as a model for the Gulf or other areas of the country.

The greatest difference between the two water regions is the size: the Lakes would easily fit in the Gulf many times over. Runoff from over 70 percent of the land mass of the United States drains into the Gulf of Mexico, depositing pollution into Gulf waters from as far away as Montana. The Gulf's circulation patterns also draw waters from the Caribbean Sea and the entire Atlantic Ocean. Although the Great Lakes have several major tributaries, the Lakes themselves drain west to east like a series of bowls out into the Hudson Bay and the north Atlantic. And, of course, the Great Lakes are a freshwater resource; the United States does not rely on the Gulf for drinking water.

The political situation is also very difficult. On the U.S. side, at least, the Great Lakes are State waters. In the Gulf, we have a rim of State waters bordering the Exclusive Economic Zone of the United States. Once you cross the international boundary line in the Gulf, you have the waters of Mexico and numerous Caribbean island States. With the Great Lakes, only Canada is involved. This calls into question the appropriate managers for any national program, as well as the structure of the program and its goals.

Finally, the Great Lakes have a long history of treaty rights and obligations which govern the use of the Great Lakes and environmental challenges to that resource. The Gulf is just beginning this phase, and there is no 20-year-old Gulf of Mexico Water Quality Agreement to guide us. It may be premature to craft a very detailed legislative program for the Gulf at this time without further guidance from our international neighbors.

From this statement, you can see that I am skeptical that the Great Lakes Program can serve as a model for the Gulf of Mexico. However, I hope that we can learn from the Great Lakes' experience and determine whether legislative direction is needed for a regional program to protect and promote the Gulf of Mexico.

Thank you, Mr. Chairman. I look forward to hearing from our witnesses.

Mr. ORTIZ. I am a member of the Armed Services Committee, and many members of this Committee also are members of the Armed Services Committee. And we have a hearing going on on Korea, and this is why several of the members couldn't be here this morning, but they will be coming in and out.

I would like to introduce the first panel which consists of two representatives of the Federal agencies involved in the Great Lakes. Mr. James D. Giattina is the Deputy Director of the Great Lakes National Program Office of the Environmental Protection Agency, and Dr. Alfred Beeton is the Director of the Great Lakes Environmental Research Laboratory of the National Oceanic and Atmospheric Administration.

Welcome, and we can begin with Mr. Giattina this morning.

STATEMENT OF JAMES D. GIATTINA, DEPUTY DIRECTOR, GREAT LAKES NATIONAL PROGRAM OFFICE, ENVIRONMENTAL PROTECTION AGENCY

Mr. GIATTINA. Thank you very much, Mr. Chairman, and thank you for inviting me to testify this morning. I hope that in reviewing the Great Lakes Program I can assist you in your deliberations as you consider establishing programs for other regional bodies of water and, in particular, the Gulf of Mexico Program.

I would like to submit my full written testimony for the record and briefly highlight my major points in the next few minutes.

Mr. ORTIZ. Your testimony, for the record, will be admitted.

Mr. GIATTINA. Thank you. Let me say at the outset that for an ecosystem approach to be successful, it must be tailored to the unique environmental, economic, and social needs of the region. Aspects of the Great Lakes Program may be transferable; other aspects may not.

The Great Lakes basin is an important part of the physical and cultural heritage of the North American Continent. It is one of the many places that define the rich tapestry of natural resources and social institutions that characterize the North American Continent. It is unique in many respects having tremendous biological resources, globally significant resources. It is unique because it contains 18 percent of the world's freshwater supply. It also supports a world-class sport fishery which has a total value which exceeds $4 billion on an annual basis.

On this invaluable natural resource is founded one of the most productive economic systems in the world. The substantial economic activity nurtured in the Great Lakes region has had much to do with making the United States-Canada trade the largest such bilateral relationship in the world. The basin, while undergoing considerable economic change over the past two decades, represents a personal income total of more than $520 billion, 11 percent of total employment, and 15 percent of manufacturing employment for the United States and Canada.

The challenge confronting the Great Lakes basin is the same challenge that is facing the Gulf of Mexico and every other region around the globe; that is, how to sustain economic and community development without eroding the health of the underlying natural systems that support that development. In my written testimony, I have described in general terms the structures that are in place, both between the United States and Canada, and within the United States that guide the Great Lakes Program implementation for pollution control.

You mentioned in your letter the Guidance, and I would like to speak very briefly about that. The Guidance is one of the most ambitious rulemakings ever undertaken by EPA, and it has had strong support from the eight Great Lakes States and extensive public involvement from public interest groups as well as the regulated community throughout its development.

The Guidance, once finalized, will establish minimum water quality standards, anti-degradation policies and implementation procedures for waters within the Great Lakes system in the eight Great Lakes States including waters within the jurisdiction of the tribes. That is an example, I believe, of the tremendous intergovernmental coordination and coordination with the public in an extensive rulemaking that characterizes the activities on the Great Lakes basin.

In addition, given the institutional structures on the Great Lakes, we have seen significant environmental improvements over the last 20 years, not the least of which has been the restoration of Lake Erie, which was once termed the Dead Sea of the North American Continent. Today, Lake Erie is a world-class walleye fishery, and the economic development and rejuvenation of the shorefront is remarkable. In addition, we have seen significant re-

ductions in the release and presence of toxic substances in the fishery throughout the Great Lakes basin.

The Great Lakes Program is viewed by EPA as a model for conducting large scale ecosystem protection across international boundaries. There are three key aspects which I believe are essential for any regional program to be successful: First, government activities must be flexible in responding to the issues that confront the preservation of these natural systems. We must be capable of working at different levels of geographic resolution and on different issues based on the community needs and the economies founded on those systems.

Second, regardless of scale, ecosystem management requires coordinated, integrated action among many partners at Federal, State, tribal, and local agencies, partnerships between government and private enterprises, and, most importantly, between government and the people governed. Many environmental, social, and economic problems of today are intertwined and beyond the purview of any one program or any one agency. Government can both empower its citizens and catalyze all sectors into action to solve their communities' problems.

The third point is that if public leadership is critical to success, information is key to empowerment and to move communities to action. The availability of quality information on the resource to be protected or restored is essential. Whereas, our traditional approach to environmental protection spawned rules for an agency to follow, the ecosystem approach calls for dedication to flexibility and strategically responding to the best information on the needs of the resource and the human community dependent on that resource.

Ecosystem management is a fundamentally different way of doing business. However, it is not a painless endeavor. The Great Lakes are reaping the benefits of improved environmental conditions that have resulted from strong standards, strong enforcement, and significant investments of public and private funds by the States and Federal Government in the region.

Mr. Chairman, I hope my testimony is of assistance to you in your very important deliberations. I would be happy to answer any questions that you have and provide any additional information that you may need.

[Statement of Mr. Giattina can be found at the end of the hearing.]

Mr. ORTIZ. Thank you. Thank you very much. Dr. Beeton.

STATEMENT OF DR. ALFRED BEETON, DIRECTOR, GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Dr. BEETON. Well, I have a written testimony that I would like to submit for the record.

Mr. ORTIZ. Hearing no objection, it will be included for the record.

Dr. BEETON. Thank you. I am Alfred Beeton, Director of the Great Lakes Environmental Research Laboratory of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and we are located in Ann Arbor, Michigan.

In the Great Lakes region, which includes eight States, Ontario, and Quebec, we have several environmental problems that have continued to be of great concern. These are toxic substances such as PCBs, dioxin and DDT; nonindigenous species such as the sea lamprey and zebra mussel, nutrient enrichment, loss of habitat necessary for spawning and recruitment of fishes, regulation of water levels and associated shore erosion, and recently we have been concerned about water-borne disease, the Cryptosporidium.

Most of these problems are the same ones of concern elsewhere in the United States and abroad, but we have been fortunate in the Great Lakes region to have a number of institutional arrangements which better enable us to take a concerted effort in tackling the problems; institutional arrangements which assist in attempting to maintain ecosystem integrity as well as be concerned about economic vitality of the region.

In the Gulf of Mexico and other regions of the United States, focused high-quality environmental science coupled with ecosystem approach, aggressive management, and informed policymaking will do much to ensure the sustainability of a region's resource base. Fundamentally, the ecosystem approach is one founded on the recognition that physical, chemical, and biological processes are intimately linked and greatly affected by human activities.

Overall, some of the largest obstacles in the path of implementing an ecosystem approach are institutional in nature. Apart from the institutional adjustments, there has been an ongoing effort in the Great Lakes community to more clearly define and clarify the inherent objectives of the ecosystem approach. And the ecosystem approach really is talking about a primary focus on ecological integrity, a means of protecting the natural system, a perception that the ecosystem is a self-sustaining system that humans and the environment coexist in an interactive ecological system, that there are natural ecological boundaries that really have nothing to do with arbitrary jurisdiction of a political nature, and that there is a holistic orientation toward resource management.

Beyond promoting the ecosystem approach, the Great Lakes Water Quality Agreement, which goes back to the Boundary Waters Treaty of 1909 negotiated between the United States and Great Britain, has influenced other legislation in the United States. For example, the Clean Water Act, Section 118, specifically recognizes the U.S. responsibility in working toward goals of the Water Quality Agreement.

There are a number of other institutional arrangements such as the Great Lakes Charter that was signed by the eight governors of the Great Lakes States and the premiers of Ontario and Quebec to conserve the levels and flows of the Great Lakes, protect the environmental balance, and make sure that development was compatible with our environmental concerns. Another agreement that was signed among the governors and the premiers was the Great Lakes Toxic Substance Control Agreement.

Recently, there is an ecosystem framework that is being put together under the International Joint Commission to enable us to really move further toward developing the ecosystem management approach. What is really encouraging recently are 20 midwestern States and Federal agencies which have made a commitment to-

ward implementing an ecosystem management, and that is, I am happy to report, now underway.

There are several other institutional arrangements that I could mention, but I want to conclude by saying that overall much has been accomplished toward building a responsive, coordinated, cost-effective research infrastructure in the Great Lakes ecosystem. This has required unprecedented cooperation among the States and Canada. You might ask the question is this model transferable to other regions in the United States, and I believe it is, given patient commitment and mutual trust among the States in the region and any foreign nations with interest in a shared ecosystem approach. Thank you.

[Statement of Dr. Beeton can be found at the end of the hearing.]

Mr. ORTIZ. Thank you, doctor. I have a question for Mr. Giattina, and my question is how accurate is EPA's $200 million estimate for the cost of implementing the Great Lakes Guidance? I understand that a study conducted for the Council of Great Lakes Governors estimates that industry and government could pay up to $2.3 billion a year to comply with the regulations. How can the discrepancy between these two figures be explained? I mean, that is a big, big discrepancy.

Mr. GIATTINA. Mr. Chairman, I can only say at this point that the preliminary cost analysis that we have included in the proposal for the Guidance we believe is scientifically sound. However, we are in the process of accepting comments and, most importantly, information and data that can be provided on better approaches or better information to do cost and benefit analysis for the initiative. I cannot speak to the details of the economic analysis that has been done either by EPA or the Governors Council, but we are in the process of reviewing all of the information.

I believe the testimony notes that we have received over 23,000 comments on the Initiative from over 5,000 individuals, and we are in the process of working through that information and will be revising and coming out with a final regulatory impact assessment as part of the Guidance's final publication next year.

Mr. ORTIZ. But you don't have any idea at this point in what areas are the cost? Is it equipment?

Mr. GIATTINA. Well, that is a very difficult question. We made certain assumptions in the development of the cost and benefit study in the Guidance, but, of course, as you know, the cost can certainly be defrayed in many instances for any individual facility. It is very facility-specific depending on what that particular industry or the particular municipality has to do; what kinds of pretreatment programs and base treatment technologies are already in place; their willingness to pursue pollution prevention and other alternative mechanisms to achieve reductions so it is very difficult to generalize across-the-board on these issues.

Mr. ORTIZ. I have another question for you, and maybe both witnesses—if Dr. Beeton would like to answer after you answer the question. Should the process used to develop the Great Lakes Water Quality Guidance be used as a model for developing other regional programs?

Mr. GIATTINA. I believe the process that was used was unprecedented in terms of the level of public involvement from the very be-

ginning starting in 1989 throughout this entire process and continuing this next month when in April we will be holding a public meeting in Chicago to accept even further comments on the proposed Guidance. I believe that aspect, as much as any other, is a very important model for EPA to continue to follow in its other rulemaking exercises: extensive public involvement.

To the extent that the ecological resources of the Gulf of Mexico and any other region in the country are interlinked, it certainly does make sense to evaluate the need for common and consistent standards for those bodies of water. And there is currently within the context of the Clean Water Act the flexibility to undertake that kind of analysis right now. But I believe it is important and I believe from my limited knowledge of the issues confronting the Gulf of Mexico that there are certain issues that are going to have to be tackled on an ecosystem-wide basis as opposed to an individual State or political boundary basis.

Mr. ORTIZ. And the reason I ask you this question is because the bodies of water are different when we look at the Gulf of Mexico. I mean, the Gulf of Mexico is how many times larger than the Great Lakes, and I think that—if I am wrong, correct me—we are looking at freshwater versus salt water?

Mr. GIATTINA. Absolutely. There is no question, Mr. Chairman, that the criteria values would be different from the Great Lakes to the Gulf of Mexico. The Great Lakes Water Quality Guidance—many aspects of it have been tailored specifically to the conditions in the Great Lakes.

Things such as fish consumption rates, which are acknowledged to be much higher than national averages in the Great Lakes basin, are used; factors such as fish lipid content of the fisheries in the Great Lakes. A number of factors have been taken into consideration and certainly not the least of which is the closed hydrologic regime of the Great Lakes basin which tends to limit the outflow and the elimination of material once it has been introduced into that system.

So certainly the environmental conditions from the Great Lakes and the Gulf of Mexico are entirely different, and all of those factors have to be considered in developing any kind of regional water quality standards or implementation program.

Mr. ORTIZ. Because going back when we look at the cost and the discrepancy between the $200 million versus the $2.3 million, I just wonder what the cost would be when we look at the Gulf of Mexico, but it is something that we can—as we go into other testimony. Dr. Beeton, would you like to add something to my question?

Dr. BEETON. Well, as far as the Great Lakes Guidance, this is something that NOAA really is not dealing with. This is part of the regulatory program under EPA. NOAA's role in the Great Lakes region is one of providing a good, sound, scientific basis for decisionmaking, and that is our main role, but we are doing things in cooperation with EPA, the Coast Guard, and the Corps of Engineers, and so on.

And I would say that probably the best advice that I can give is that there are a number of institutional arrangements that have been worked out in the Great Lakes region which are very cost-effective and often have a small cost associated with them. It de-

pends upon the good will and cooperation of the various Federal agencies and State agencies that recognize that they have a common mission that they need to carry out, and so I would advise looking at those various ones and seeing if there is something that might meet the needs in the Gulf of Mexico.

Mr. ORTIZ. You know, I talk about my concern about cost and who pays because, you know, when I go back to my district and I talk to my local leaders and my local officials, they talk about Federal mandates, that the Federal Government, the Congress, those of us come here, we mandate the local governments and the State governments to create, to pass, you know, whatever EPA laws, and we do them here.

And then this is going to cost them, and most of the time they don't have much of an input, and this is a problem that we are faced with. And the thing is if we increase the cost to industry, now how would that be passed on to somebody else, to the consumer, and I guess it is something that takes a lot of thinking.

Mr. GIATTINA. I certainly understand your concerns, Mr. Chairman. I think the tremendous advantage that you have in taking an ecosystem approach to a problem and forming a program office though is that you can bring many different agencies to the table, many different public interests to the table, and many of the affected community to the table to deliberate these issues.

The old model, of course, was EPA or other agencies sitting in their ivory tower developing regulations, publishing a notice in the **Federal Register** and accepting comment, and then finalizing the Guidance. And it did not strike people to be a particularly effective way to really engage the public.

When you go to these regional programs, you have to engage the public. They have to be at the table in setting the vision for that particular area. They have to understand the tradeoffs, and that has to be debated in an open fashion. And, again, public involvement is not a panacea, as you well know. Public involvement does not mean public agreement in every case, and the Guidance is an excellent example of this based on comments on the proposal, we have not satisfied everyone with what we have proposed.

Everyone that was involved in the process is dissatisfied with some aspect of the final Guidance as you might expect. But the ability to bring people to the table and certainly to leverage Federal and State funds together and leverage public and private funds is a very important aspect of the ecosystem management approach.

Mr. ORTIZ. Don't get me wrong. You know I am for clean water; I want a clean environment. But when we come to the cost and how much this is going to cost, do we try to do something big at one time that we just can't do or do we start slow and gradually build up, and these are questions that I am asking. Sometimes as I talk to my staff, you know, it takes a lot of wisdom and prayer to get to the bottom of some of these problems and trying to get a solution. But has there been any study to compare the benefits to cost?

Mr. GIATTINA. In the EPA-proposed Guidance, we did do a benefits analysis of three particular areas in the Great Lakes basin, and we are careful to point out in the Guidance that the benefits analy-

sis is not necessarily applicable to the entire basin. But comparing the costs and benefits for those three particular areas, the benefits generally were commensurate with the costs for those three particular areas based, again, on our preliminary evaluation.

Mr. ORTIZ. Thank you. I have been joined by my good friend and my colleague from Texas, Mr. Green, and if you would like to ask any questions, please proceed. We included your statement for the record, Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman, and I appreciate the opportunity to have the hearing today, and, again, I won't have any opening remarks. I will just put it in the record.

I am interested in the comparisons between the Great Lakes and the Gulf of Mexico because that is what the committee is—one of our jurisdictions, and I know the differences. If you have read minority testimony, obviously, we are talking about a freshwater body as compared to salt water and much more contact with other countries on the Gulf of Mexico than the Great Lakes with just Canada.

And, again, concern with the pollution in the Gulf of Mexico just like where the Great Lakes Program started, and how well does the Great Lakes Program address the nonsource points of pollution as compared to, you know, again, trying to relate it to what we know about the Gulf of Mexico with a great many rivers flowing in there, whether it be the Mississippi or just in Texas. We have four major rivers; one an international boundary at the Rio Grande.

And the Great Lakes Guidance—how does it not directly address the nonsource point pollution issue—and some estimates account for 90 percent of all pollutants in the Great Lakes—and does the benefit of the Guidance justify the focus on the point source pollutions that are already regulated under a national pollutant discharge elimination system? So if you could just address that.

Mr. GIATTINA. Yes. I would like to say that I disagree that the Great Lakes Water Quality Guidance does not address nonpoint sources. The Guidance, again, establishes consistent, ambient water quality criteria for human health, wildlife, and aquatic life. It establishes antidegradation procedures and policies, and it establishes implementation procedures for going from ambient conditions to controls on both point and nonpoint sources.

The criteria, once they are adopted into State standards, apply to all sources of pollution, and the mechanism within the Clean Water Act which determines what is called the Total Maximum Daily Load Calculation under Section 303 of the Clean Water Act. And the total maximum daily load is one means of accounting for both the point source contribution to a pollution problem as well as the nonpoint source contribution to a pollution problem and any natural background that exists within a particular water body.

So by establishing the criteria in the Guidance, we are very much addressing nonpoint sources in that we are stating what is the baseline that all of these sources have to eventually comply with in order to meet the ambient water quality criteria. The criteria will also serve as a basis in a number of other areas, whether it is implementation of the Clean Air Act with the special provisions under Section 112[m] of the Clean Air Act specifically related to the Great Lakes.

It could be used by CERCLA to establish how clean are clean levels for Superfund remediation. In a number of contaminated sediments issues, which is a major problem in the Great Lakes basin, it allows us to determine in many respects what we are going to have to clean in order to remove the water quality impairments.

The antidegradation policy in the Guidance applies to all sources. Now, I will grant to you that there are specific provisions in the Guidance which relate to how you control point sources and how you implement antidegradation for point sources. The fact of the matter is that we have tremendous experience in regulating those types of wastewaters because of the history of the Clean Water Act. But the Guidance, I don't believe, precludes or in any way does it let nonpoint sources off the hook.

Mr. GREEN. OK. To what extent have user groups, environmental organizations, industry—and I know our second panel will have industry spokesmen—concerned citizens been involved in the Great Lakes Program? And with respect to development of Great Lakes Water Quality Guidance and how has the input from these groups—how much input of these different groups have, and what was your impression of these groups, and were they generally satisfied with their level of input?

And let me put a caveat because representing the Port of Houston, and we are going through a lot of the concerns about dredging material and how we have it both ways—we want both a deeper channel, but we also want to have someplace to put that clean dredge material—and we held a hearing last year in Houston on that, and I can see the contamination of the sediment problem that you talked about in the earlier question—because we try to bring all those groups together, and I know that is the only way you can really be successful.

Mr. GIATTINA. Yes, sir. I believe that one of the most important aspects of the development of the Great Lakes Water Quality Guidance is that it did have unprecedented, I believe, public involvement throughout the process. Remember that the development of the Guidance started as a voluntary effort by the eight Great Lakes States and EPA.

At that point in time, we brought a wide spectrum of people to the table from environmental groups to the regulated community that were engaged with us in every step of the process. They were able to attend technical work group meetings and have input as the technical experts debated various aspects of the project. They were able to attend all of the steering committee meetings and comment to the steering committee on their concerns and issues throughout the process. That has all been documented in the administrative record.

After publication as we moved into the regulatory process as a result of revisions to Section 118 of the Clean Water Act in 1990, we still continued to have extensive public involvement. After the publication of the proposed Guidance, the States themselves sponsored a number of public hearings at various locations around the State to discuss the Guidance, explain what it was, and to seek public input. Those are all part of the administrative record.

We have been meeting with the eight Great Lakes States over the last three months with representatives of their environmental

agencies to discuss their particular issues with the Guidance as it was proposed. And this next month we are going to be holding yet again another open public hearing in Chicago toward the end of April to solicit further comment. And I think that approach has very much paid off.

As I said earlier, public participation does not mean public satisfaction of everyone. You can't please everybody, and I think that everybody that was involved in the process recognizes, however, that while they may not agree completely with everything that is in the proposed Guidance, that they did have a very effective forum for expressing their concerns throughout the process.

Mr. GREEN. The last question—I will give you time because, obviously, you wouldn't be implementing the Guidance if you didn't think it would significantly improve the water quality, but could you share that as brief as possible with the committee on what you expect once we see the further implementation of it?

Mr. GIATTINA. I think with further implementation of the Guidance when it is finalized, and, again, I can't foresee exactly how the Guidance is going to come out under the final rule, but I believe that there will be significant improvements. I don't want to pull the wool over your eyes in any way, shape, or form.

A number of the very significant problems that are confronting the Great Lakes are the result of an historical legacy of industrial activity and wastewater discharges and include substances that once you release them into the system, they are there and they are going to continue to recycle through that system for many, many years. We are talking on the orders of centuries.

But even given that fact, we expect that there will be significant improvement under the Guidance because of the range of pollutants that it addresses, and the fact that given the Guidance and given the criteria which will also drive nonpoint source control activities, that we will see significant reductions in the nonpoint source side in the years to come.

Mr. GREEN. Thank you, Mr. Chairman.

Mr. ORTIZ. Thank you. I just have one last question before we move. Dr. Beeton, go ahead.

Dr. BEETON. Well, I would be remiss if I didn't mention that NOAA has some responsibility in regard to nonpoint source in the Coastal Zone Management Act. And my own opinion is that we don't have the final word in yet on nonpoint source. I personally have been involved eight years in a nonpoint source study, and it is very difficult to determine what the inputs are from farmland and from urban areas and so on. I think there is a lot more research that is needed before we really have the answer on that.

And, when you look at the Gulf of Mexico and realize that the Mississippi River is flowing into the Gulf of Mexico, then you start thinking about nonpoint source. You are talking about a major part of the United States as being a nonpoint source impact on the Gulf of Mexico. That is something that really should be a major concern.

And in that regard, I should mention that NOAA has had a research program underway on the Gulf of Mexico called the Nutrient Enhanced Coastal Ocean Productivity. And, in fact, my own laboratory from Ann Arbor has been working in cooperation with people at Texas A&M and in Louisiana and in Florida on that very

problem looking at what is the impact of nutrients from a large river on a coastal system. So that makes me wonder about the nonpoint source, just the results of that study and the significant impact that that outflow of the Mississippi has on the Gulf of Mexico.

Mr. ORTIZ. Thank you very much. Mr. Giattina, thank you very much and, Dr. Beeton, for your testimony this morning. Do you have questions? Congressman Laughlin, another Texan. We are in good company. We are all Texans here this morning.

Mr. GREEN. Obviously, we all value the Gulf of Mexico. Between the three of us, we share most of the Texas coast.

Mr. LAUGHLIN. I do have some questions, Mr. Chairman.

Mr. ORTIZ. What I will do now is—I am sorry—I have an Armed Services Committee hearing going on that deals with the pressures on South Korea. I will turn over the committee Chair to my good friend, Mr. Green, and Mr. Laughlin will be joining him. And like I say, you can't go wrong when you have all Texans in this hearing this morning. Mr. Green.

Mr. LAUGHLIN. Mr. Giattina, I want to ask you about the Great Lakes and then move to the Gulf of Mexico. A concern that many of us have who live and represent people who work and pay taxes along the Gulf of Mexico is the Great Lakes Initiative and the experience, that some of the companies that employ a substantial number of people and pay substantial salaries and, in turn, those people pay taxes and so do the companies, of the experience in the Great Lakes, and we are fearful that your agency is going to come down to the Gulf of Mexico and inflict much of the same regulations without concern as to the difference in the Gulf of Mexico as it relates to the Great Lakes.

And I make the point that Dr. Beeton has just made, that while Ann Arbor, to my geographic knowledge of the United States, is not located on the Gulf of Mexico, and this is another problem that we have had with your agency and others in the Federal Government, that for some reason they find it necessary to fund research on the Gulf of Mexico inside the Beltway of Washington, DC, and at universities located far away. To us it is an unnecessary expense for those researchers to travel to the Gulf of Mexico when we have just as fine, if not finer, universities more knowledgeable about the Gulf of Mexico than those in the northern tier of this United States.

But having said that, I have given you a brief thimble of indication of the distrust that those of us that represent the Gulf of Mexico region of this country have for your agency and others in the Federal Government who have slighted our people when it comes to spending your research dollars there, and, Dr. Beeton, I know you hear what I am saying even though I am looking at Dr. Giattina or Mr. Giattina. Those are reasons why we are very uncomfortable with your agency and why I was moved last week to tell the Administrator that if I had it within my power, I would abolish the EPA, and those are strong words for someone who enjoys the environment.

Let me ask you the justification in the Great Lakes for causing industries to have a requirement that they clean up the water when it is a pass-through for their facility? And let me give you this example of one industry that has been to see me. I am not sure

that I can explain in this brief time intake credits, but I am sure you understand that. But as I understand intake credits, industry is in a position where they are required to clean up the water even though it merely passes through their facility as a cooling element. Do you follow what I am talking about?

Mr. GIATTINA. Yes. Yes, sir.

Mr. LAUGHLIN. And in that process, that industry adds nothing to the water by way of a pollutant or a contaminant or any foreign matter that was not in the water when it left the Great Lakes and entered the intake pipe or the intake valve and merely went through the system to cool off the manufacturing or the refining process and is discharged at the end in the identical, precise pollutant contaminant makeup as it was when it entered. What is the justification there? Because once I hear it, I have got another question right behind it.

Mr. GIATTINA. OK. I will do my best to answer, Mr. Laughlin. I am not an expert on all aspects of the Guidance, but let me just say that the current intake credit provisions are proposed. They are not final, and we are accepting comments on the intake provisions in the Great Lakes Water Quality Guidance. It is not quite as simple perhaps as it has been described to you. We have also included within the context of the Guidance a number of provisions that would allow industries to alleviate the need for treating intake water if it is truly contaminated and if they are not adding pollutants to the process.

That is certainly one scenario that you described that it is possible where an industry may remove water from a stream or a river, pass it through the cooling system, and discharge it back to the river. There are other scenarios, however, that intake credits are designed to address as well. For example, an industry using contaminated groundwater in a cooling system and then releasing or discharging the contaminated groundwater to a surface water body. It may, in fact, be introducing a new load of chemicals into that receiving water body. There may need to be provisions, and that situation needs to be looked at.

But it certainly is not as simple as I think requiring an industry to treat all of the river that is flowing to it from upstream. I think that that is a mischaracterization of what is actually in the Guidance, and that there are a number of provisions from variances and other mechanisms to alleviate any unnecessary burden on industries in that particular situation.

Mr. LAUGHLIN. Well, I certainly see a distinction in industry bringing water from below the surface and then interject it. That is totally different, in my way of thinking and I hope it is in yours, from taking surface water and moving it from one side of a body to another side when, in fact, the contaminants were put there by some entity other than the one that is merely using it for a coolant. Wouldn't that make sense to you?

Mr. GIATTINA. Yes, sir, and, again, I think that is a very specific circumstance in the Great Lakes. We, of course, have that situation, but it is not quite as simple. A number of the industries that have complained about it have also added that particular pollutant to the water historically and have contaminated sections of rivers downstream from their pipe, and they are also subject to receiving

waters that are contaminated from other industries upstream of them and are dealing with that situation.

Mr. LAUGHLIN. And I am sure you have made that distinction in your regulations, that those who have polluted in another portion of the Great Lakes ought to be responsible for cleaning it up——

Mr. GIATTINA. Yes.

Mr. LAUGHLIN [continuing]. in other parts, and you would distinguish between those companies that perhaps only have one facility in the Great Lakes region who have neither contributed to the pollution and would not be expected to clean up the pollution when it goes through their facility when it is merely a cooling element. Is that in your thinking as you work on this Guidance?

Mr. GIATTINA. Mr. Laughlin, certainly we are considering all of the comments that we have received on that, and I can't judge exactly how the final Guidance is going to come out at this point. We are sifting through, as I mentioned, over 23,000 individual comments on the Guidance at this particular point in time. It is probably one of the most extensive rulemakings that EPA has ever undertaken.

Mr. LAUGHLIN. Again, my geography is limited to the Great Lakes—a lack of familiarity compared to the Gulf of Mexico, but my memory is there are a lot of rivers that flow into the Great Lakes but none of the magnitude and watershed basin that the Mississippi River and its many varied tributaries would have. Is that correct?

Mr. GIATTINA. Oh, yes.

Mr. LAUGHLIN. The Great Lakes would pale by comparison to the Mississippi River. Wouldn't that be fair to say?

Mr. GIATTINA. Well, I guess I wouldn't use the word pale. I don't know the total flow out of the St. Lawrence Seaway, for example.

Mr. LAUGHLIN. Does the St. Lawrence flow into the Great Lakes or into the Atlantic?

Mr. GIATTINA. It flows into the Atlantic. It is the outlet of the Great Lakes basin.

Mr. LAUGHLIN. Well, it wouldn't be contributing pollutants, would it?

Mr. GIATTINA. No, no. There are certainly——

Mr. LAUGHLIN. So we can discount the St. Lawrence River as a contributing factor to any of the pollutants in the Great Lakes. True?

Mr. GIATTINA. Yes, absolutely.

Mr. LAUGHLIN. All right. Now, think of all the other rivers, and can you put them all together, and can they even come close to the magnitude of the Mississippi and the Ohio and the Monongahela and the Allegheny, and stop me if I name one that doesn't eventually drain into the Mississippi, the Missouri, and Lord knows how many rivers I have offended for not naming them, and emptying at some point, draining into the Mississippi? Those that would drain into the Great Lakes would pale by comparison; in fact, would be insignificant compared to the distribution system of the Mississippi River. Isn't that true?

Mr. GIATTINA. Well, certainly the total flow of the Mississippi is going to exceed the total flow of any of the tributaries to the Great

Lakes system. That is certainly true. I don't know what the numbers are, but it is certainly true.

Mr. LAUGHLIN. Don't hold me to the exact figure, but I think I have read recently that perhaps 70 percent of the United States has its watershed area drain into the Gulf of Mexico. That is significant, isn't it?

Mr. GIATTINA. Absolutely.

Mr. LAUGHLIN. Now, would you agree with me that to apply the same standards in the Gulf—the same standards that you are contemplating in the Great Lakes and to the Gulf of Mexico would not be a fair comparison when you consider the vast amount of industry that is located on the Ohio, the Monongahela, the Allegheny, the Missouri, and the Tennessee, and I think there is a Wabash River in there, and the Mississippi—all those industries and all those various States draining into the Gulf of Mexico and then expecting the industry located in five Gulf of Mexico States to bear the brunt of cleaning up the pollutants under the standard that you have applied in the Great Lakes Initiative?

Mr. GIATTINA. Mr. Laughlin, I don't know that the standards that have been developed, the criteria that have been developed would apply or not apply to the ecological conditions in the Gulf of Mexico. You are talking about two entirely different bodies of water. The standards for the Gulf of Mexico would certainly have to be tailored to the environmental conditions of the Gulf, and I have no way of knowing at this point in time what parts of the Guidance would even be transferable, if any.

Mr. LAUGHLIN. Well, I think you are correct, and I agree with you, but what bothers me is statements by people in your agency that the Great Lakes Initiative is the model by which all other clean water, large body water cleanup is to be measured and judged, and just in this few moments of discussion with my very limited knowledge of this area, we have agreed that there is a vast difference in these two important bodies of water.

And so as a representative of this region, I have great concern that your agency will try to measure and use the same regulations that you have been using in the Great Lakes to apply to the body of water where people work and industry is providing jobs in the area that I represent.

Mr. GIATTINA. Yes, sir. I can't put words in anyone else's mouth, but from my standpoint, when I say or I would say that the Great Lakes Water Quality Guidance is a model for other regions of the country, I certainly do not mean that the individual criteria that were developed are necessarily going to be the same across the country. I think that when I use that phrase what I am saying is that the process that was used to develop the Guidance in terms of the collaborative work that was done with the eight Great Lakes States—please recall that the Initiative started as a voluntary effort among the eight Great Lakes States and EPA—there were two basic principles that led to the Guidance.

First of all, the States wanted to recognize the unique ecological conditions of the Great Lakes basin, and, secondly, the States wanted to level the playing field, if you will, from one State to the other in terms of the standards and implementation of those standards for pollution control across the basin.

So those are the two fundamental principles that led to the development of the Guidance, and I think that the partnership that was formed between EPA and the States as well as the extensive public involvement in the process, that is really what serves as a model for doing similar approaches in other water bodies throughout the United States. But it would be contrary to the entire water quality standards program to arbitrarily say that the criteria for PCBs in the Great Lakes is the same criteria for PCBs in the Gulf of Mexico.

Mr. LAUGHLIN. Well, certainly the leadership of those eight States are to be commended for recognizing they had a problem and seeking a solution, but what my point is, is the model that your agency has held out of being the Great Lakes does not necessarily transfer to the Gulf of Mexico for the very basic, simplistic reasons you and I have already agreed on. Isn't that true?

Mr. GIATTINA. Yes, in terms of the specific criteria that were developed, I agree.

Mr. LAUGHLIN. Now, what do you mean by the model because you have used that several times? Your agency uses it, and you have used it in your responses. What do you mean by the Great Lakes Initiative being the model?

Mr. GIATTINA. Actually——

Mr. LAUGHLIN. And I must tell you that it worries me because if you use something as a model, it means you are going to use it somewhere else.

Mr. GIATTINA. When I say either the Great Lakes Initiative as a model or the overall Great Lakes Program as a model, what I am saying is that there are certain aspects of how we have developed our institutional relationships and how we have approached problems within the Great Lakes basin that are applicable to other parts of the country. I do not mean that the details of either the Guidance certainly are applicable elsewhere in the country.

I would like to point out that the Guidance itself is just one aspect of the overall Great Lakes Program, that we are dealing across-the-board at many different levels of geographic resolution, from watershed scales all the way up to basinwide efforts. We are looking at both voluntary and regulatory means to work with the regulated industry and to work with the public to achieve their environmental goals. We have engaged the public in virtually every aspect of our program. We are not simply focusing on toxics.

We have one of the most significant success stories in modern times in the recovery of Lake Erie and other near-shore waters from excessive nutrient introductions. We are looking to habitat issues similar to the Gulf and devising strategies so the Great Lakes Program is a very broad program and a broad set of activities. The Guidance is only one aspect of that overall program, and I believe that there are many things that we are undertaking within the Great Lakes that are transferable and are being adopted in other parts of the country.

Mr. LAUGHLIN. As your model of developing the working groups, again, I don't know how much tourism is on the Great Lakes, but the Gulf of Mexico has a great tourist industry that enjoys the bays, the estuaries, the fishing, and the hunting. Fishing and hunting and shrimping are important industries there. When I talk

about industry, many people think I am talking about the oil companies, but there is a tremendous industry of fishing and shrimping and hunting and swimming and boating and sunning and getting sunburned. Are you and your agency working with all these various elements of the industry: the tourism across-the-board to the oil companies?

Mr. GIATTINA. Yes, sir, we are. Tourism is very important, and outdoor activities are very important in the Great Lakes region. We are working with the Sport Fishing Institute and sport fishing industry which is very, very big in the Great Lakes basin. I might add that I am actually a native of Birmingham, Alabama, and every summer I had the pleasure of vacationing on the Gulf and enjoying the Gulf. It is a very special place for me as well, and I recognize the tremendous importance of this resource. Tourism and attracting people to the region is very important for both areas of the country.

Mr. LAUGHLIN. Well, how do you allow the various elements of industry, the oil companies, the industry that employs—the manufacturing industry, the tourism industry, the fishing industry—how do you allow them to participate and give their input and then how do you qualify it as to what input you are going to take into consideration?

Mr. GIATTINA. We basically don't qualify any of the input that we receive. We take all of the input and try to weigh the evidence as best we can. We have literally in virtually all aspects of our program, whether it be the Guidance, whether it be working on pollution prevention initiatives with the auto industry, or the printing industry, whether it be working on our Contaminated Sediments Demonstration Program that was called for under the Clean Water Act. Every one of those activities, we have literally brought affected parties to the table to sit down and discuss with us how to move forward. We have engaged extensive public outreach in all of those activities, and we literally convene a meeting and ask people to come in and sit down and talk to us about what we are doing, why we are doing it, and how we are going to proceed.

Mr. LAUGHLIN. So if I am the general manager of the Laughlin Refining Company on the Great Lakes, and am invited to a workshop or a session where I can express my concerns and give the EPA information as to the impact of your regulations on my industry and my ability to hire and pay employees' salaries and pay taxes, will that be impacted by your regulations?

Mr. GIATTINA. Yes, sir.

Mr. LAUGHLIN. And you, of course, take that into consideration?

Mr. GIATTINA. Yes, sir.

Mr. LAUGHLIN. Now, the Great Lakes, like the Gulf of Mexico, is an international body of water in that there is a foreign country on the other side—at least bordering the Great Lakes. How is Canada involved and how supportive is the country of Canada in the initiatives of the EPA and the Great Lakes?

Mr. GIATTINA. We have a number of forums for coordination with Canada on the Great Lakes. One of the primary forums, as I have described in my written testimony, is the International Joint Commission which is composed of three representatives appointed by the Prime Minister of Canada as well as three U.S. representatives

appointed by the President. There are support boards to the International Joint Commission that is composed of both representatives from Federal agencies and States within the United States as well as the Canadian Federal agencies and the Province of Ontario.

In addition, we work directly party to party, if you will, with the Canadians. We have formed what is called a Binational Executive Committee which is chaired by the Great Lakes National Program manager and the director general of the Ontario Region of Environment Canada. We also have other Federal agencies participate on that executive committee as well as States and provincial representatives. So we have a number of coordination mechanisms.

In general, I think the binational cooperation between the United States and Canada on environmental issues is unprecedented. It doesn't mean that we don't have certain issues, but we are willing to sit at the table and work together to work those issues out. We received comments from Canada on the Great Lakes Water Quality Guidance, in particular, and, in general, they were supportive of the U.S. effort. They view it very much as a U.S. effort which is tailored to the particular legal and regulatory mechanisms that we have in this country.

Mr. LAUGHLIN. So Canada, in general, is supportive and cooperative, and generally the rules that apply to entities on the American side of the Great Lakes apply to those entities on the Canadian side of the Great Lakes?

Mr. GIATTINA. I would not go that far. There are significant differences in the environmental protection programs in the United States in comparison with those in Canada. We have a completely different legal and regulatory system in the United States, and there are very important fundamental differences with how the Canadian Government at the Federal and provincial level implement environmental laws.

What we have strived to do is to not get into the details of a sovereign country's implementation of its environmental laws but try to set common objectives and each country be allowed to move toward those objectives in the most expedient fashion possible, but there are very significant differences between the United States and Canada as far as environmental protection.

Mr. LAUGHLIN. So I take it your agency will continue to cooperate and work with the Canadian entities to try to get their companies on line with what we are requiring of our companies so that it would be somewhat of a level playing field for competitive reasons?

Mr. GIATTINA. Yes, sir.

Mr. LAUGHLIN. So on the economic competitive whirl, right now the Canadian companies have a significant advantage?

Mr. GIATTINA. I can't comment. I can only say that, yes, we will continue to work with them to try to get the same level of control as on the Canadian side.

Mr. LAUGHLIN. But at least the Canadian companies have an advantage from an economic viewpoint if they are not having to comply with the same rules as the American companies. Wouldn't that be fair?

Mr. GIATTINA. Yes, sir. I think it is a short-lived advantage, however. I think in the long run companies that choose to not pay at-

tention to environmental matters, it is simply a symptom of a larger management problem. And I think in the long run they are going to be at a competitive disadvantage in the world markets.

Mr. LAUGHLIN. Now, recognizing the complexity of dealing with companies on the borders of the Great Lakes both in countries who are cooperative and supportive and having that complex situation, it even gets substantially more complex when you move to the Gulf of Mexico where you have multiple international countries—foreign countries with borders on the Gulf of Mexico, some of who are not cooperative in the least bit. Isn't that true?

Mr. GIATTINA. I cannot comment on the situation in the Gulf.

Mr. LAUGHLIN. Well, how cooperative is Cuba?

Mr. GIATTINA. I think your point is very well-taken, but I can only imagine the difficulties.

Mr. LAUGHLIN. Now, we are just scratching the surface of why companies that employ people and pay salaries and taxes in my region are uncomfortable about the same rules and the same model being applied to them that were drafted where you have a foreign country that is at least cooperative and understanding and trying to clean up the Great Lakes and have that apply to where we have at least one and probably more than one uncooperative country and our companies are being straddled with the same rules and regulations that would come from the Great Lakes. You follow the concern and understand with great compassion the understanding of that problem, I take it?

Mr. GIATTINA. Yes. I understand it. I have heard it many times.

Mr. LAUGHLIN. OK. And I would hope you would have great compassion for the difference and the complexity of the problems that these entities that employ people are going to encounter.

Mr. GIATTINA. Yes, sir.

Mr. LAUGHLIN. And for that reason, the approach to the Gulf of Mexico that many of us are involved in and believe in need to have a different look than the look that is given to the Great Lakes.

Mr. GIATTINA. Yes, sir. In my opening remarks, I immediately acknowledged that the value of an ecosystem approach or the value of these regional programs is that they, in fact, have to be tailored to the ecological and the economic and the social needs of a particular region. That is the entire benefit of going to a regional view of the issues and trying to resolve the issues from a regional or an ecosystem standpoint.

So very definitely every region of the country will take on somewhat of a unique character in terms of the institutions that are already in place as well as the social, ecological, and economic conditions.

Mr. LAUGHLIN. Do you agree if the right balance is struck that industry and wildlife can coexist?

Mr. GIATTINA. Absolutely, I think it is imperative.

Mr. LAUGHLIN. That has been my experience. I have taken enough of your time. Thank you very much. Mr. Chairman, that is all the questions I have. Dr. Beeton, thank you for your quick message that the Gulf of Mexico has a feeding body that brings it different elements that are not all put there by the companies and industries located in the five States that border the Gulf of Mexico.

Dr. BEETON. Yes. Can I answer one other thing?

Mr. LAUGHLIN. Sure.

Dr. BEETON. I don't want to leave you with the impression that we think we have all the answers in the Great Lakes, and, therefore, we are coming down to the Gulf of Mexico and doing a lot of research. As a matter of fact——

Mr. LAUGHLIN. Well, if we believe that, that would be the second northern aggression in this country.

Dr. BEETON. Well, I wanted to leave this on a positive note, that certainly from a very fine institution like Texas A&M that there are people there with expertise that are working on the Great Lakes. And so the bottom line is where the important expertise lies. If there is some particular expertise that we have, we are willing to offer that, and likewise the people from Texas and Louisiana are offering their expertise to us as to some Great Lakes problem.

And I wanted to also indicate that the primary role that NOAA has in the Gulf of Mexico is a research conducted through the Fisheries Laboratory and the Atlantic Oceanographic and Meteorological Laboratory which are both based in Miami, Florida.

Mr. LAUGHLIN. But, doctor, you must have read my bio by your selection of Texas schools, but I have got to confess to you also that I am a graduate of the University of Texas, and both universities have a number of institutions on the Gulf of Mexico area involved in research dealing with the Gulf. And certainly Florida, Alabama, Mississippi, and Louisiana have some wonderful universities doing great research.

And the offensive thing to us from this region was the fact that three years ago we discovered that the Federal agencies were spending more money inside the Beltway on research in the Gulf of Mexico than they were in all five of our States combined. And I think if you were employed at one of the great universities in any of the five States, you would have been offended.

Dr. BEETON. Well, I would be offended too because a lot of the research that applies to the Great Lakes is not necessarily done in the Great Lakes region so I share your concern.

Mr. LAUGHLIN. Yes. We just don't want a monopoly in another part of the country is what we are saying.

Dr. BEETON. Right, nor do I.

Mr. LAUGHLIN. Thank you very much. I thank both of you.

Mr. GREEN. [presiding] Thank you, Congressman Laughlin. I would like to also thank the agencies who are represented here for sharing their insights in the Great Lakes Program, and several of the Subcommittee members and I have other questions. If you would be available to respond in writing, we would appreciate it, and thank you for coming.

Mr. GIATTINA. Yes, sir.

Mr. GREEN. We will pause for a brief moment while the staff rearranges the room for the second panel.

Mr. LAUGHLIN. [presiding] I would now like to introduce the second panel which consists of representatives of the Great Lakes Commission, industry, and the environmental community. First, we will hear from Dr. Michael Donahue, Executive Director of the Great Lakes Commission. Next, we will hear from Mr. Dale Phenicie, the Task Group Chair of the Environmental Policy Advisory Group of the Great Lakes Water Quality Coalition. Third, Mr.

Timothy Scruggs, Manager of Amoco Corporation's Whiting Refinery, will offer his comments. And, finally, we will hear from Mr. George Coling, a Great Lakes Specialist with the Sierra Club.

I would like to remind this panel also that their entire written statement will appear in the record and be made a part of the record and to please limit their oral testimony to five minutes as indicated by the lights on the witness table. Mr. Donahue, you may begin with your testimony, keeping in mind the lights are going to come on.

STATEMENT OF DR. MICHAEL DONAHUE, EXECUTIVE DIRECTOR, GREAT LAKES COMMISSION

Mr. DONAHUE. Thank you, Mr. Chairman. I appreciate the opportunity to testify on behalf of the Great Lakes Commission which is an interstate compact agency that represents the economic, environmental, and resource management interests of the eight Great Lakes States. I am accompanied today, I should add, by Mr. Joseph Hoffman who is an official with the Pennsylvania Department of Environmental Resources and also the elected Chair of the Great Lakes Commission.

I want to commend you for your interest in examining the collective Great Lakes management experience as a possible model from which to draw ideas in developing programs for other regional bodies of water including the Gulf of Mexico. We in the Great Lakes-St Lawrence basin maintain a tradition of binational, multijurisdictional cooperation that dates back to the middle decades of the 19th century.

The Great Lakes system is one of the world's largest freshwater laboratories and is the bellwether of scientific investigation. It is also one of the world's largest laboratories for institutional experimentation. What we learn here from both our successes and mistakes can form the basis of knowledge for future actions and management efforts elsewhere.

This morning, I will limit my remarks exclusively to the items identified in your letter of March 15 to me which is a discussion of programs, funding mechanisms, regulations, and information networks that have been established to improve and protect the Great Lakes. Other detail will be provided in the written testimony.

With regard to Great Lakes programs, despite the elaborate legal and institutional infrastructure in the Great Lakes basin, there is, in fact, no single program within which all of the policy and planning and research and management initiatives are pursued. Rather, the collective programmatic approach in the basin is more appropriately described as a patchwork quilt that is held together by common threads of shared philosophy and assembled over time by myriad agencies and organizations both within and outside government. The design and effective operation of regional, multijurisdictional institutional arrangements is critical to the viability of this patchwork quilt and as such offers an important lesson for the development of basin programs in other regions.

We benefit greatly from the presence of four principal publicly funded regional organizations, the Great Lakes Commission, International Joint Commission, the Great Lakes Fishery Commission,

and the Council of Great Lakes Governors, that have had important coordinative functions within our collective Great Lakes Program.

As noted earlier, the U.S.-Canada Great Lakes Water Quality Agreement is recognized as a principal unifying force in the binational Great Lakes basin, and, generally speaking, may serve as a model for potential application to a U.S.-Mexico or other binational setting.

The Great Lakes National Program Office of USEPA, which you heard from earlier, does indeed serve as a centerpiece of the U.S. Federal Government's commitment to the Great Lakes, and the eight-member States of the Great Lakes Commission fully support that Office's role under the agreement and view the Office as an appropriate institutional framework to address the unique requirements of the Great Lakes region. It is a model for coordinating EPA's Great Lakes presence and, due to its focus, is ideally suited to undertake and coordinate projects of regional, national, and international significance.

As noted earlier, the Office also serves as a critical link with the Canadian Government on efforts to develop and implement binational remedial action plans. This is an essential role that cannot be adequately filled by the governments of the Great Lakes States alone.

As a final observation on the collective Great Lakes Program, another new initiative warrants special consideration. It entails development of an ecosystem charter for the Great Lakes-St. Lawrence basin. It is a nonbinding effort coordinated by the Great Lakes Commission with Joyce Foundation support, and it details an effort to develop, adopt, and implement a policy statement or a charter that ties together all the common principles that we collectively believe in as governments, as businesses, as industries, and as nongovernmental groups. When that effort is completed, it might have some applicability to other areas as well.

My written testimony offers some comments about funding mechanisms. It also addresses the Great Lakes Water Quality Initiative that, with some qualification, we believe would have some applicability in other basins.

As a closing comment, I note that it is imperative that the growing trend toward basin-oriented programs not fall victim on a national scale to a zero sum financial game. We in the Great Lakes have described our efforts as a national model, as we have heard earlier, and we have been most eager to accommodate inquiries from other regions. At the same time we recognize that this trend may temper our own ability to maintain and enhance our stature at the Federal and congressional levels.

We believe that interregional cooperation, not competition, should be the byword, and fostering linkages with emerging basin programs is, in the long run, in the best interests of all concerned. We at the Great Lakes Commission stand ready to support and assist in this effort. Thank you.

[Statement of Mr. Donahue can be found at the end of the hearing.]

Mr. LAUGHLIN. Thank you, Mr. Donahue. Next, we will hear from Mr. Phenicie.

STATEMENT OF DALE PHENICIE, TASK GROUP CHAIR, ENVIRONMENTAL POLICY ADVISORY GROUP, GREAT LAKES WATER QUALITY COALITION

Mr. PHENICIE. Thank you, Mr. Chairman. My name is Dale Phenicie. I am Regulatory Affairs Manager for Georgia-Pacific Corporation. I serve as the Environmental Policy Task Group Chairman for the Great Lakes Water Quality Coalition and am appearing on their behalf here today. I also serve as Chairman of the American Forest and Paper Association's Great Lakes Task Force and participate in that organization's Gulf of Mexico Task Force.

While the coalition agrees that the objective of the GLI to improve water quality in the Great Lakes is an important one, the current proposal will not achieve that result. The lesson that must be taken from the GLI experience is that EPA must not implement a regulatory program when it has been widely recognized that it will not meet the stated objectives.

Much of the GLI is based on R & D efforts which are preliminary. The resulting methodologies for setting water quality standards are new and unproven. The outcome has been the premature codification of these procedures and a regulatory program when, at best, they should only be used as guidance in a pilot-testing mode.

The coalition is not alone in this view. Even EPA's own Science Advisory Board agrees that many of the concepts on which the proposal is based are not ready for use in enforceable regulatory programs. The lesson learned here directly applicable to the Gulf of Mexico is that GLI style or any other new methodology must be fully developed and tested if the goal of protecting water quality is to be met.

Much of the GLI is really unnecessary. Dr. Paul Rogers, a noted Great Lakes researcher, has conducted a study which has included over 1,000 references and a poll of 19 regional experts on the state of the Great Lakes. The state of the Lakes is, in fact, much better than EPA or Congress assumed when the Great Lakes Critical Programs Act was enacted. I would like to provide copies of this report for the record. It documents that water quality has been greatly improved. Fish and bird populations including the bald eagle have increased dramatically. It is the trouble spots that need to be addressed.

The eight Great Lakes governors contracted with DRI-McGraw Hill to conduct an independent cost benefit study. The report concluded that by any tangible measure, that is, water quality improvements, fish advisories listed, closed beaches reopened, no benefits would occur. DRI, the Council of Great Lakes Governors, and OMB have dismissed EPA's benefits analysis as methodologically flawed and based on false data or faulty analysis. DRI's overall conclusion was that the agency has picked the least cost-effective set of options.

Finally, the GLI places the cart before the horse. Comprehensive environmental assessment management approach, also required under the Act, in the form of LaMPS; Lakewide Management Plans, are now in various stages of development. They are intended to identify and prioritize the remaining water quality issues in the Great Lakes before the agencies regulate. The LaMP-like assessments, which are now underway in the Gulf of Mexico through the

efforts of the existing Gulf of Mexico Program, should continue in order to identify the needs and priorities.

Some comments about the effects of the GLI. The governors' study and others conducted by industries and municipalities project that cost to municipalities would be $7 billion in capital costs and $3 billion in annual costs. Six major industrial sectors have estimated capital costs at $6 billion with $2.3 billion annual cost. The cost in jobs was estimated at $33,000. Administrative costs will also be radically increased. A joint study conducted by Georgia-Pacific and the Gary, Indiana, Sanitary District has determined that it will take four years of studies and document preparation at a cost of $1.5 to $3 million just to file a permit application.

In conclusion, the overriding lesson is that in the Gulf of Mexico, environmental assessments, cost-effective analysis, risk assessments, and economic studies must serve as the foundation for continuing the Gulf of Mexico Program efforts.

I would like to respond just briefly to a couple of Mr. Giattina's comments, one on nonpoint sources. My reading of the GLI requirement says that nonpoint sources are accounted for in the TMDL process but not controlled. The control that Mr. Giattina talks about comes fully at the expense of ratcheting down on the point sources to accommodate the nonpoint sources. In response to his answer on intake credits involving variances, let me say that those variances are temporary and only granted after a lengthy and very rigid evaluation procedure. Thank you very much.

[Statement of Mr. Phenicie can be found at the end of the hearing.]

Mr. LAUGHLIN. Thank you very much, Mr. Phenicie. Mr. Scruggs, we have your record with your statement which, without objection, will be made a part of the record. We welcome you.

STATEMENT OF TIMOTHY SCRUGGS, MANAGER, WHITING REFINERY, AMOCO CORPORATION

Mr. SCRUGGS. Thank you, Mr. Chairman. I am Tim Scruggs, Manager of Amoco's Whiting, Indiana, Refinery, the largest inland refinery in the United States located on the southern shore of Lake Michigan in the greater Chicago metropolitan area.

Amoco has been a part of the Whiting community for more than 100 years and presently employs over 1,600 people almost all of whom live within the Lake Michigan watershed. We supply over 70 percent of the general tax base to the community of Whiting and 71 percent of the funding to the local school system which I might mention has the highest per capita student spending of any school system in Indiana.

Amoco and its more than 14,000 employees residing throughout this region appreciate the Great Lakes as a natural resource. We are dependent on the Lakes' water and committed to its preservation and improvement. Our refinery studies have indicated that Amoco's capital outlay to comply with the Great Lakes Initiative as written will be in excess of $200 million. For this reason, I appreciate the opportunity to appear here today before this Subcommittee and share our views concerning the GLI.

Amoco is interested in ensuring a fair and workable GLI that will further protect and preserve the Great Lakes. We also believe

that a robust economy and strong employment base are vital to the future of this region. Therefore, we strongly support the position that only through sound science and risk-based controls can we create successful environmental policies and achieve the objectives of both environmental and economic health in the Great Lakes basin.

The GLI was mandated under the Critical Programs Act of 1990. Unfortunately, the proposal is based upon command and control principles and does not allow for the flexibility to account for local and site-specific conditions. Amoco has supported a comprehensive, regionwide approach that addresses all sources of pollutants of concern and determines which emissions pose the greatest harm to human health and to the environment. Unfortunately, most of the recommendations promoted by Amoco and representatives from industry and municipalities have not been adopted in this proposal.

As a matter of course, Amoco believes that all environmental protection policies should be based on accurate science. Such policies should set achievable goals, be flexible to recognize local conditions, and allow for the use of cost-effective alternatives.

And, finally, all implemented policies should result in measurable environmental improvements for the capital spent. Our analysis of the GLI proposal indicates that it does not meet these fundamental tests. The GLI will not result in any measurable environmental benefit. Because of its narrow focus on point sources, it will not achieve significant reductions in pollutants of concern, nor will it result in the lifting of any fish consumption advisories, the traditional indicator of Great Lakes impairment.

As concluded by the DRI-McGraw Hill study mentioned a moment ago, commissioned by the Council of Great Lakes Governors, the GLI will not significantly improve the water quality of the Great Lakes while imposing compliance costs of up to $2.3 billion on Great Lakes industries and municipalities.

One of the GLI's biggest problems is that its underlying premise is flawed. It is not truly an ecosystem approach to regulating toxic pollutants even though the EPA describes it as such. A true ecosystem approach would consider all sources and fates of pollutants within the Great Lakes basin.

The GLI, however, only addresses industrial and municipal point sources which account for a very small percent of the toxic loadings to the Great Lakes. Nonpoint source sources such as air deposition, urban and agricultural runoff, and contaminated sediments are not regulated. Studies have shown that these nonpoint sources contribute over 90 percent of the toxic loadings to the Great Lakes. This omission will result in significant water quality problems remaining even after the GLI is implemented. By that time, valuable time and resources for addressing the most critical problems will have been spent.

Two provisions with which the Whiting Refinery specifically has concerns are arbitrary restrictions on mixing zones for nonbioaccumulative chemicals also known as nonBCCs, and intake credits. A mixing zone is an area in the vicinity of a facility's outfall where a discharge undergoes mixing with the receiving water. Currently, all water quality standards must be met at the edge of the mixing zone. EPA guidance recognizes that mixing

zones do maintain the overall biological integrity of a water body and eliminate unnecessary end-of-pipe controls.

The GLI, however, proposes to arbitrarily restrict the size of a mixing zone for nonBCCs. This will require the Whiting Refinery to install over $50 million of additional treatment even though such additional controls may be unwarranted and scientifically unjustified.

Mr. LAUGHLIN. Mr. Scruggs, can you kind of summarize in the next minute or so?

Mr. SCRUGGS. Certainly.

Mr. LAUGHLIN. We would appreciate it.

Mr. SCRUGGS. We believe that industry and government rationally must work together toward the goals of improving the Great Lakes area both environmentally and economically and can bring about drastic improvements if worked together. For only by balancing environmental and economic interests on the basis of sound science and economic reality will the goals of the Great Lakes Initiative, the Gulf of Mexico, or any other regulatory initiative be truly attainable. Thank you.

[Statement of Mr. Scruggs can be found at the end of the hearing.]

Mr. LAUGHLIN. Thank you very much, Mr. Scruggs. Mr. Coling, likewise, we have received your statement which, without objection, will be made a part of the record. In fact, there is nobody here to object—and you may proceed. We welcome you today.

STATEMENT OF GEORGE COLING, GREAT LAKES SPECIALIST, SIERRA CLUB

Mr. COLING. Thank you. I also brought over an addendum which I refer to in the written remarks, but I won't go verbally, and I hope they would be——

Mr. LAUGHLIN. Sure. They will be made a part of the record, Mr. Coling.

Mr. COLING. Thank you. The Sierra Club has around 100,000 members in the Great Lakes. It has worked strongly for the 1987 amendments to the Clean Water Act. We have worked with other organizations including many at this table for adequate funding for EPA's GLNPO and programs of other agencies in the Great Lakes. We support even further coordination such as Mr. Fingerhut's bill, H.R. 2566, which would coordinate research efforts in the Great Lakes. And we have generally supported the institutional model of government programs in the Great Lakes.

While doing so, we even more support the role, particularly of GLNPO, in leading to the United States' compliance with the Great Lakes Water Quality Agreement. Last negotiated in 1987 between the United States and Canada, the agreement is what we term visionary. The most important of the objectives of the Great Lakes Water Quality Agreement is to virtually eliminate persistent toxic substances in the Great Lakes environment.

As Great Lakes citizens, we have no moral choice but to work for this objective. Scientific evidence continues to mount that our polluted society is tinkering with future generations' ability to enjoy health, to achieve full human developmental capacity, and to repro-

duce. Those most at risk are the children of those exposed to the persistent toxic chemicals.

Our support, as I just said, of the structure and organization of Federal agencies in the Great Lakes is predicated upon their active missions to implement the Great Lakes Water Quality Agreement using domestic laws such as the Clean Water Act, in particular, we are talking about today, to implement a plan for protecting ecosystem and human health, and seeking international partnership with Canada, of course.

I want to highlight a couple of these program objectives which we support and speak to on, the work on contaminated sediments. One, as I said earlier, the virtual elimination of persistent toxic chemicals through zero discharge. The second is to identify, assess, and remediate toxic hot spots. The agreement with Canada sets up specific institutional relationships for doing so.

In 1987, the Clean Water Act provided money for a pilot program to essentially look at the first steps in detoxifying contaminated harbors. It is a great success story. The five-year program is over. There is need to expand it to a larger scale. It has had a good partnership experience. There is a fact sheet among those addenda that I just suggested, and currently there is a need to expand this kind of assessment of technologies into the salt water areas of the country, the Gulf of Mexico, New York Harbor, wherever. This is kind of a world-class scientific effort as we see it, and it needs a salt water dimension.

And other objectives that we need to look at in the Great Lakes are reducing airborne deposition, controlling polluted runoff, and delivering environmental justice. Sierra Club feels the Great Lakes Water Quality Initiative is needed because much of the shoreline does not support Clean Water Act designated uses. There is far too much legal dumping of persistent toxic chemicals in the Great Lakes, and there is kind of a hodge-podge of regulations in the Great Lakes States for these specific issues.

And I guess my time is up. The one comment I have on the economics of the Initiative is that we feel, and the analysis that Sierra Club commissioned by economists at the University of Wisconsin of the DRI study, which is included in the documents, is that the tourism aspect in the Great Lakes is underestimated so far, and there is a great threat to tourist jobs and fishing jobs from not cleaning up further. And that would include not only point sources but also nonpoint contaminated sediments especially and other sources. Thank you very much.

[Statement of Mr. Coling can be found at the end of the hearing.]

Mr. LAUGHLIN. Thank you, Mr. Coling. I want to ask this question of the panel in general and ask for you to give a short response. Is the Great Lakes Guidance what was envisioned when the Great Lakes Initiative process was commenced in 1989? And we will just begin with you, Mr. Donahue, and go down the line for a brief comment on that.

Mr. DONAHUE. That is somewhat difficult to answer because I believe that different things were envisioned by different individuals. Allow me to step out of my Great Lakes Commission role for a moment and step into my role as the U.S. Co-Chairman of the IJC Science Advisory Board. After some lengthy discussions about the

Initiative at the binational level, we found its primary value to be that of enhancing intergovernmental coordination and consistency irrespective of what the standards or criteria are. It makes inherent good sense for multiple political jurisdictions that share the same body of water and the same system to have consistent standards.

To clarify an earlier statement, I did want to point out that the Science Advisory Board of the IJC, in its report to the IJC Commissioners, did indeed recognize that the Initiative, if fully implemented, is likely to lead to reduced inputs of persistent toxics. It was further recognized as an important step in moving the Federal Government and States toward the goal of virtual elimination as provided for in the Water Quality Agreement. It is not a panacea, but it was recognized as an appropriate first step.

I think the big lesson learned for U.S.-Mexico applicability is that when these efforts are undertaken at a domestic level, there should be sensitivity toward any other binational agreements that are in place.

The Science Advisory Board noted some inconsistency between the specifics of the Initiative and the objectives in the Great Lakes Water Quality Agreement. We recognize that these things need to be done in a binational forum in order to be fully consistent with one another.

Mr. PHENICIE. I think the question of has the Guidance turned out what was envisioned is a little difficult because this has been a long process. This thing has been under development for about five years. The public participation in the early stages was somewhat limited, and by the time some of us were included in the process, many of the decisions on the direction of the program had already been made. By that time, the decision to develop criteria which would apply broad-based across the basin had already been made.

There had not been or there wasn't after we got into the process, discussion of doing the broad ecosystem study and trying to determine specifically what are the needs and then looking to see whether or not the program was going to address those needs or whether or not the program would, in fact, accomplish the objective of improved water quality. And as I said during my statement, there are several people who have evaluated this program and have determined that we will not see measurable benefits as a result of the extremely tight standards which this program would set.

Mr. SCRUGGS. Your question predates my assignment into this geographical area so I am somewhat unfamiliar with your origin. But I would say this, it was intended, I think, to bring about a consistent set of regulations and, if you will, level the playing field among the Great Lakes States. In my sense, yes, it has probably done that. It was also intended to take an overall ecosystem view of the Great Lakes basin and look at all of the sources of pollution and improve the Great Lakes water quality. In that sense, I would say, no, it has not done that. It is not an overall ecosystem view. It only pertains to point source water discharges and does not look at, regulate or control other means of pollution.

Mr. LAUGHLIN. Mr. Coling.

Mr. COLING. Yes. I find myself agreeing to some extent with my two colleagues here—the last two comments. I think we envisioned a broader public participation process, and, again, to EPA's credit, this is an enormous document, and it proved difficult to get out and get the best comments of knowledgeable people.

Mr. LAUGHLIN. Did I understand you to say you envisioned a broader involvement than was occurring? I missed the first part of what you were saying.

Mr. COLING. Yes. The public participation process did not reach out—filter out into the grassroots community organizations—Indian tribes and others—as much as we had envisioned. And I am trying to give EPA credit because it is a huge technical area. And we also recognize the emphasis that needs to be put on polluted runoff, contaminated sediments to which I just spoke, airborne deposition of persistent toxic chemicals in the Great Lakes.

The Initiative process has been a follow-through mechanism, and it is an initiative of the eight States in the area, and that was, I believe, what the Sierra Club envisioned for those eight States working together rather than had odds.

Mr. LAUGHLIN. Good. Mr. Donahue, from your perspective, are the Federal agencies coordinating their activities effectively in the Great Lakes basin?

Mr. DONAHUE. There is clearly always room for improvement, but our feeling at the Great Lakes Commission is that there is an excellent partnership emerging, and it is coming from both levels, I believe. For example, the Great Lakes National Program Office of USEPA through its U.S. Policy Committee is making a good faith effort to coordinate on a collegial basis rather than a top-down approach with its fellow Federal agencies and the States.

From the State level as well there is an effort along those lines. The Great Lakes Commission, which through State and Federal law is exclusively a membership organization of the Great Lakes States, has modified in recent years its bylaws to permit the designation and full participation of formal observers. And I am pleased to note that we have over a dozen United States and Canadian Federal, provincial, and regional agencies that are now directly involved in partnership with the eight member States of the Great Lakes Commission. I believe the partnership approach in the Great Lakes basin is more fact than rhetoric, and I think it is one of the positive aspects of intergovernmental cooperation that we can point to in our basin.

Mr. LAUGHLIN. Mr. Phenicie, to what extent will industrial facilities have to alter their manufacturing processes to comply with the requirements of the Great Lakes Water Quality Guidance, and has the EPA correctly estimated the cost of compliance with these regulations, or do you foresee expenses above and beyond those predicted by the EPA?

Mr. PHENICIE. Well, I will answer the second part of the question first; that is, certainly EPA has not included all of the costs. And as I pointed out in my testimony, the cost to the industrial sector is immense. And those costs come from the fact that this program looks at, I believe it is 145 different chemical substances, sets very, very stringent water quality criteria for those chemicals, and then puts each permit applicant through the TMDL process that was

mentioned here earlier to arrive at what the final discharge limit should be for each of those substances.

So what you end up with is a very stringent set of regulations you have to meet so there are additional treatment facilities that would have to be installed. There are probably process changes that would have to be made, and there may be some things that you just can't do any longer in order to be able to meet these standards.

Mr. LAUGHLIN. Mr. Scruggs, we have heard today that the EPA has proposed not to provide intake credits. Will this decision require facilities to remove pollutants that do not originate from their operations?

Mr. SCRUGGS. Yes, it would. Our facility, for instance, is a major user of once-through or noncontact cooling water. We use about 120 million gallons a day, and I say that—this water does not come in contact with the process, does not receive any contaminants from the process. A good portion of it is used to condense steam used in power generation.

The Great Lakes Initiative would require us to treat that water extensively, which is cost prohibitive and would put us in the business, frankly, of cleaning up Lake Michigan water of pollutants that are in the intake that we don't produce, we don't handle, we don't manufacture.

Mr. LAUGHLIN. Well, do you do it at some other place on the Great Lakes?

Mr. SCRUGGS. No. The Whiting Refinery is really our only major facility in the Great Lakes area. These would be chemicals that we have never had anything to do with. We would be in the business of cleaning them up, and that provision would account for about three-quarters of the total capital cost to our facility.

Mr. LAUGHLIN. Could you give us some dollar estimate?

Mr. SCRUGGS. Well, we have estimated that at $150 million.

Mr. LAUGHLIN. Also, Mr. Scruggs, the EPA proposal estimates the impact of the GLI to the entire Great Lakes region will be between $50 to $200 million. Other sources including the Council of Great Lakes Governors' DRI-McGraw Hill study indicates the cost could exceed $2 billion. That is a pretty wide range from where I come from. How do you account for the huge difference in the cost? And as I understand just a moment ago, you said your estimate is $150 million for your one plant, or are you taking all the plants——

Mr. SCRUGGS. Well, again, we only have one major facility on the Great Lakes.

Mr. LAUGHLIN. My question is, is the $150 million——

Mr. SCRUGGS. That would be for—that would be——

Mr. LAUGHLIN [continuing]. for just your plant or all the plants in the Great Lakes, for all the companies in the Great Lakes?

Mr. SCRUGGS. We would be required at the Whiting Refinery, as the proposal is written today, to spend approximately $200 million. $150 million of that would be because of the provisions on once-through cooling water. The other $50 million would be to treat our process effluent water because of the elimination of mixing zones. I am not an expert on how the EPA derived their numbers, but the $200 million is an engineering grade estimate for our facility. That

means we believe it is within 20 percent accuracy, and those are the facilities that we would be required to put in today to meet the regulations as written.

Mr. LAUGHLIN. So if your engineers have any credibility, their estimate would just about wipe out the estimate by the EPA of $50 to $200 million? Is that——

Mr. SCRUGGS. That is correct.

Mr. LAUGHLIN. So whatever the difference is would have to be used up in their estimate by all the other companies in the Great Lakes area, or their estimate would be inaccurate, wouldn't it?

Mr. SCRUGGS. It would appear to me. I am not an expert on their estimate, but, again, we know that the cost for our facility alone would be about $200 million.

Mr. SCRUGGS. Mr. Donahue, do you know where the EPA got their cost estimates of the impact of the GLI?

Mr. DONAHUE. No, I don't.

Mr. LAUGHLIN. You see the difference in figures that we are having to deal with. Your agency has estimated $50 to $200 million, and Mr. Scruggs's company has engineers, and if they are to be believed, and I am not saying that they are, but if they are believed, they just about wipe out your estimate.

Mr. DONAHUE. That is correct. There does seem to be a great inconsistency there. I should explain that we operate with the Council of Great Lakes Governors on something of a sister agency mode on occasion, and with respect to the Great Lakes Water Quality Initiative, the Council of Great Lakes Governors commissioned the DRI-McGraw Hill study. My commission has not conducted any in-depth analysis of the economic impacts itself.

Mr. LAUGHLIN. Dr. Donahue, I owe you two apologies. One, not calling you doctor because I got reprimanded one time by a wife of a doctor for not calling him doctor so I apologize on that score. I never want to make that mistake again. And, secondly, I accused you falsely of working for the EPA.

Mr. DONAHUE. I am not sure which of those omissions I resent more but——

Mr. LAUGHLIN. Well, in my area, the second one might get you a trip to the penitentiary. It is not quite that bad, but some days it is. Mr. Scruggs, several witnesses have said the GLI as proposed will not significantly improve the water quality of the Great Lakes for the huge cost incurred. What benefits will the GLI as proposed provide to the Great Lakes from your company's viewpoint?

Mr. SCRUGGS. I think it will provide a marginal decline in some of the pollutants present in the Great Lakes. Again, our studies or the studies I have seen say that over 90 percent of the total pollutant load into Lake Michigan would not be regulated or affected by the Great Lakes Initiative. So we would expect a minor few percentage decline in pollutants in the Great Lakes. No change in the fishability, swimability of the Lake.

Mr. LAUGHLIN. Mr. Coling, do the benefits of the Great Lakes Water Quality Guidance justify its focus on point sources despite the fact that nonpoint sources account for a large percentage of pollutant inputs into the Great Lakes and despite the fact that point sources are already regulated under the National Pollutant Discharge Elimination System?

Mr. COLING. The level of dumping legally dumped chemicals under the system you just mentioned is too high to tolerate. We, nevertheless, agree that the Great Lakes Initiative as proposed is a first step and other sources, airborne, polluted runoff, and contaminated sediments, especially need to be addressed by EPA forthwith.

Mr. LAUGHLIN. Mr. Coling, I would make one other observation with you on the nonpoint source pollution, and you have probably detected by now I come from a large rural area. There have been proposals before our Congress and, in fact, this committee to heavily tax some activities called farming in the agricultural areas of America by placing a tax on fertilizers, herbicides, and green feeds so that that tax money can be used to attack nonpoint source pollution we think primarily comes from the cities.

And I would cite you the example in my State, if you look at the Colorado River, and I represent all the Colorado River in Texas from Lake Travis to the Gulf of Mexico with the exception of that which is in the city of Austin. The city of Austin has a reputation of being a hotbed for environmentalists. Some of my farmers call them worse than that, but they are an environmentally-sensitive community. And you probably have heard of that reputation.

Mr. COLING. I have.

Mr. LAUGHLIN. And I do not say it derogatorily, but I want to say it to make this point. Upstream from the city of Austin is some of the most pristine water in America, and we are proud of that, and I represent that lake area where there is wonderful boating and swimming and fishing and scuba diving. After that same river water flows through the city of Austin, the hotbed of the environmental community of my State, it is unswimmable, if that is a good English word—let me say it another way—the kids in my Colorado County area just outside of Austin cannot swim in the water. They can't eat the fish out of the water. Yet, after that water goes through the rice fields further downstream, it comes out much cleaner, coming out of the agriculture fields that we are wanting to tax to pay for the nonpoint source pollution problems of the cities. And you see the point I am trying to make. I hope that we can't attack this problem by just taking on the agriculture producers. Would you agree with that?

Mr. COLING. I would agree that the problem needs kind of an allocation kind of a look, and many parts of the economy contribute to environmental problems—agriculture, urban, various other rural industries maybe not in your district, mining or whatsoever contribute, and definitely we need to——

Mr. LAUGHLIN. Well, I appreciate your comment because it points out that this nonpoint source pollution is a broad-based problem. I think that is what you are saying.

Mr. COLING. Yes.

Mr. LAUGHLIN. Or do you disagree with that? I was waiting for your yes or no answer.

Mr. COLING. Absolutely. It is a pressing national issue.

Mr. LAUGHLIN. OK. Well, I thank all of you very much. This concludes the testimony for this panel, and I want to thank you for the valuable testimony and insights you have shared with us today. I know Chairman Ortiz would have preferred to stay here, but as

you have seen us come and go, I even had to leave, and this is an important topic to me because of the interest I have in the Gulf of Mexico. I think that we have heard interesting testimony this afternoon that will be useful to the Subcommittee as we continue to consider the most appropriate way to structure a Gulf of Mexico Program.

Several of the Subcommittee members and I have questions for the witnesses, and we would appreciate your reply for the record in writing. Thank you very much for coming today and have a good one.

[Whereupon, at 12:08 p.m., the hearing was adjourned, and the following was submitted for the record:]

TESTIMONY OF
JAMES D. GIATTINA
DEPUTY DIRECTOR, GREAT LAKES NATIONAL PROGRAM OFFICE
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO,
AND THE OUTER CONTINENTAL SHELF
AND THE
SUBCOMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES
OF THE
MERCHANT MARINE AND FISHERIES COMMITTEE

MARCH 24, 1994

Good morning, Chairman Ortiz, Chairman Studds, and distinguished members. My name is Jim Giattina, Deputy Director for the Great Lakes National Program Office of the United States Environmental Protection Agency (EPA). Thank you for inviting me to testify this morning. I hope that in reviewing the Great Lakes Program, I can assist you in your deliberations as you consider establishing programs for other regional bodies of water, particularly the Gulf of Mexico. I will begin with some general observations and then discuss the specific concerns noted in your invitation letter of March 7, 1994.

OVERVIEW

The Great Lakes Basin is an important part of the physical and cultural heritage of North America. It is one of the many places that define the rich tapestry of natural resources and social institutions that characterize the North American continent. The Great Lakes are also unique in many respects because they compose the largest system of fresh surface water on earth, containing roughly 18 percent of the world's supply of such waters..

On this invaluable natural resource is founded one of the most productive economic systems in the world. The substantial economic activity nurtured in the Great Lakes region has had much to do with making the U.S. - Canada trade the

largest such bilateral relationship in the world. The Basin, while undergoing considerable economic change over the past two decades, represents a personal income total of more than $520 billion, 11 percent of total employment and 15 percent of manufacturing employment for the United States and Canada. The Great Lakes Basin also supports a world-class sport fishery, the total value of which exceeds $4 billion on an annual basis.

The challenge confronting the Great Lakes Basin is the same challenge facing the Gulf of Mexico and other ecosystems around the globe: how to sustain economic and community development without eroding the health of the underlying natural systems that support that development. Ecosystem management, the focus of all EPA regional water programs, provides an approach that integrates environmental protection with human economic and social needs, considers long-term ecosystem health, and highlights the positive correlations between economic prosperity and environmental well-being.

THE GREAT LAKES PROGRAM -- JOINT MANAGEMENT OF THE GREAT LAKES

I would like to turn my attention and address the specific matters raised in your March 7, 1994, letter of invitation. Let me begin by describing the major institutional arrangements associated with binational coordination of pollution control programs on the Great Lakes.

The International Joint Commission

The 1909 Boundary Waters Treaty established the International Joint Commission (IJC) of Canada and the United States. The treaty created a unique process for cooperation in the use and protection of waters along the international boundary, and for those waters that cross the border between the two nations, including the Great Lakes. The IJC has three responsibilities for the Great Lakes under the original Treaty:

(1) limited authority to approve applications for the use, obstruction or diversion of boundary waters on either side of the border that would affect the natural level or flow on either side;

(2) to conduct studies of specific problems as requested by the governments with implementation of the recommendations resulting from the IJC studies being at the discretion of the two governments;

(3) to arbitrate specific disputes which may arise between the two governments in relation to boundary waters. The governments may refer any matters of difference to the Commission for a final decision, a procedure which requires the approval of both governments but has never been invoked.

In addition to these specific powers under the 1909 Treaty, the IJC provides a procedure for monitoring progress under the Great Lakes Water Quality Agreements of 1972 and 1978, as revised by protocol in 1987. The IJC is supported in these activities by two standing advisory boards: a Water Quality Board (WQB), consisting of the staff of federal, State and provincial pollution control and natural resource agencies; and the Science Advisory Board, consisting primarily of government and academic experts who advise the WQB and the IJC about scientific findings and research needs.

The United State-Canada Air Quality Agreement

Since the Great Lakes Program addresses water quality from an ecosystem/watershed standpoint, atmospheric deposition into waters and contributing watersheds is important. The U.S.-Canada Air Quality Agreement, signed on March 13, 1991, provides a mechanism to link the Clean Water Act (CWA) and the Clean Air Act (CAA) and their joint areas of concern. Atmospheric

deposition is a significant source of pollutants to the Great Lakes ecosystem and close coordination between all media are critical to success. Water quality in all five class I areas in the Great Lakes ecosystem are affected by atmospheric deposition both upwind and from inside the ecosystem.

The Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement (GLWQA or Agreement) establishes the purpose of the United States and Canada (the Parties) to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem. It also calls for achieving common water quality objectives, improved pollution control throughout the Basin, and continued monitoring of progress of the two countries by the IJC. Through the Annexes to the Agreement, the Parties have committed to undertake a variety of integrated management approaches at different geographic scales including Lakewide Management Plans, Remedial Action Plans for Areas of Concern, and joint surveillance and monitoring, to address pollution concerns throughout the Basin. The GLWQA is the primary document that outlines the policies and the underlying commitment to ecosystem management that guides coordination between the United States and Canada for protecting the Great Lakes.

The Binational Executive Committee

Because the IJC's primary role under the Agreement is one of reviewing and evaluating progress, and providing recommendations to the two countries, the United States and Canada have established a forum for conducting Party to Party discussions. That forum is the Binational Executive Committee (BEC) and is composed of representatives from federal, State, and provincial pollution control and natural resource agencies on each side of the border. The BEC establishes binational priorities for joint actions carried out by the two countries to implement

the Agreement; establishes joint, ad hoc work groups as necessary; and oversees the execution of the priority actions. Staff support to the BEC is provided by the EPA's Great Lakes National Program Office (GLNPO) and by Environment Canada's Great Lakes Environment Office.

Coordination of U.S. Partners in the Great Lakes Program

For meeting the U.S. obligations under the Agreement, the U.S. State Department has delegated lead responsibility to EPA. Within EPA, the National Program Manager (NPM), Valdas Adamkus (who is also the Regional Administrator of Region 5) has lead responsibility for coordinating U.S. actions under the Agreement. The NPM is supported in this capacity by GLNPO.

GLNPO, organized in 1978, is the first Office established by EPA with responsibilities that are defined by natural, ecological boundaries as opposed to political boundaries. GLNPO and its roles and responsibilities have also been established in law by Congress with the 1987 amendments to the Federal Water Pollution Control Act. GLNPO's role is perhaps best described as that of a catalyst and a facilitator. Other EPA offices within Headquarters and Regions 2, 3, and 5, other federal agencies, and the eight Great Lakes States also play vital roles in implementing the laws and policies affecting the Great Lakes ecosystem.

To address basinwide policy and priority-setting issues, EPA established the U.S. Policy Committee. This group developed a joint Federal/State Five Year Strategic Plan for the Great Lakes, agreed to in April of 1992. This strategy is discussed in greater detail below.

Multi-agency Federal-State Teams have been formed to deal with problems at a Lakewide scale e.g. fish consumption advisories) and at the watershed scale (e.g. contaminated sediments, habitat loss). These efforts, known as Lakewide

Management Plans and Remedial Action Plans are discussed further below.

In addition to coordination at the federal level and between federal and State agencies, the Great Lakes States have also established a political and technical infrastructure for joint action.

The Council of Great Lakes Governors is a not for profit corporation devoted to providing a regional approach in addressing the economic and environmental challenges facing the Great Lakes States. Through the Council, the Governors have: agreed on a Great Lakes Charter that established "principles for the management of Great Lakes water resources"; developed a "Great Lakes Toxic Substances Control Agreement" as a basis for integrated action; and played a substantial role in creating and funding the Great Lakes Protection Fund.

The Great Lakes Protection Fund has been endowed by the Great Lakes States which pledged $100,000,000 which now provides the source of funds for annual grants in support of important Great Lakes projects. The projects address a wide range of activities consistent with the Fund's vision "to identify, demonstrate and promote regional action to enhance the health of the Great Lakes ecosystem". The Great Lakes Commission was created by state legislation and is devoted to advocacy for public policies that address the linkage between the goals of environmental protection and economic development.

THE GREAT LAKES PROGRAM -- ACHIEVEMENTS AND ONGOING CHALLENGES

A number of management tools and programs have been developed and implemented within the context of the above organizational structure to achieve coordinated action and improvements in the quality of the Great Lakes resource. In most cases the programs are mandated by the GLWQA and/or U.S. federal statutes (i.e., the CWA and the CAA). I will briefly highlight the most significant

programs and activities underway and, because of your particular interest in the Great Lakes Water Quality Guidance, I will discuss it in relation to these other activities.

Strategic Planning

The Great Lakes 5-Year Strategy, noted earlier, provides an organizing framework for conducting specific programs. The Strategy is a multi-media, multi-agency commitment with three key objectives:

(1) to reduce and virtually eliminate toxic substances, with an emphasis on persistent, bioaccumulative pollutants, from the Great Lakes ecosystem;

(2) to protect and restore habitats vital to supporting healthy and diverse communities of plants, fish and wildlife; and

(3) to ensure the protection of human health while restoring and maintaining the biological diversity of the Great Lakes ecosystem.

The Strategy includes specific commitments and activities that will be undertaken jointly to achieve the above objectives, including, for example, efforts to remediate contaminated sediments, implement CAA to reduce the atmospheric deposition of pollutants, undertake pollution prevention programs, inventory and develop strategies to protect important habitat throughout the Basin, and conduct monitoring and information management activities.

The Great Lakes Water Quality Guidance

Mr. Chairmen, you expressed particular interest in my views on the Great Lakes Water Quality Guidance (Guidance). Let me begin by saying that the Guidance is one of the most ambitious rule-makings ever undertaken by EPA. The Guidance, once finalized, will establish minimum water quality standards, antidegradation policies, and implementation procedures for waters within the Great Lakes system in the eight Great Lakes States, including the waters within the jurisdiction of Indian Tribes.

The Great Lakes Water Quality Initiative was launched jointly and voluntarily by EPA and the Great Lakes States in 1989, with strong public participation in every phase of development. In 1990, Congress passed the Great Lakes Critical Programs Act (CPA) which amended Section 118 of the CWA. The general purpose of these amendments was to improve the effectiveness of EPA's existing programs in the Great Lakes by identifying key agreements between the United States and Canada in the GLWQA, imposing statutory deadlines for the implementation of these key activities, and increasing federal resources for program operations in the Great Lakes Basin. Section 101 of the CPA ((CWA Section 118(c)(2))) requires EPA to publish proposed water quality guidance for the Great Lakes system which conforms with the objectives and provisions of the GLWQA and is no less restrictive than provisions of the CWA and national water quality criteria and guidance.

Guidance -- Rationale

The tremendous economic productivity of the region over the past three centuries has exacted a heavy toll on the ecological integrity of the Basin. For the past two decades, chemical pollution of the waters, first nutrient enrichment and then toxic substances, has dominated the environmental agenda for the Great Lakes. Physical, chemical, and biological factors combine to make the Great Lakes system sensitive to the presence of pollutants, particularly substances that persist

in the environment and/or bioaccumulate in organisms and, therefore, cycle within the ecosystem for long periods of time. Substantial declines in the presence of many of the more well-known pollutants (e.g., PCBs and chlorinated pesticides) have occurred. However, the rate of decline for a number of chemicals present in fish tissue may be leveling at unacceptably high concentrations. The deleterious effects of persistent and bioaccumulative substances on the Great Lakes food chain are well documented.

The primary rationale for the Guidance is the development and implementation by EPA and the States of a water quality standards program for toxic substances that recognizes the unique aspects of the Great Lakes system. In addition, the Great Lakes States also wanted to jointly agree on minimum requirements for establishing and implementing water quality standards in order to eliminate inequities from State-to-State and "level the playing field" for wastewater discharges throughout the Basin. As a result, key factors that could lead to undesired large differences in control requirements among states, such as risk levels, fish consumption rates, bioaccumulation rates and methods of calculation, discharge-receiving water mixing assumptions, and restrictions on the release of bioaccumulative chemicals of concern (BCCs), have been addressed in the Guidance.

Guidance -- Costs, Benefits, and Potential Impacts

As part of the rulemaking effort, EPA has assessed compliance costs for facilities that would be affected by the proposed Guidance. The Agency has also assessed benefits for three sites in the Great Lakes system. The Agency's best estimate at the <u>total</u> compliance costs from the proposed Guidance across the entire Great Lakes Basin are in the order of $230 million per year for the 272 major industrial direct dischargers, the 316 major municipal direct dischargers, the 3,207 minor direct dischargers, and the estimated 3,500 indirect industrial dischargers to

municipalities. The proposed Guidance also contains several provisions that are available to the States which may decrease compliance costs, including: site specific modifications to variances from water quality criteria; compliance schedules; and development of phased total maximum daily loads (TMDLs). The potential decreased compliance costs attributable to each one of these mechanisms was not included in the cost study.

Using the three case study sites, EPA estimated benefits for the following categories: recreational fishing, recreational boating and swimming, subsistence fishing, commercial fisheries, waterfowl and other hunting, non-consumptive wildlife observation, human health benefits, nonuse/ecological values, and dredging and navigation. Where numbers could not be developed for a category, potential benefits were discussed in qualitative terms for the proposal. The case studies indicate that benefits from the proposed Guidance were commensurate with the costs. The results of these case studies are not appropriate to use in evaluating the aggregate benefits of the proposed guidance. The most significant benefits were attributed to reduction in bioaccumulative pollutants impacting recreational fishing and nonuse/ecologic benefits.

The Agency solicited public comment and supporting data on the methodologies used in the study to estimate both costs and benefits for the proposed Guidance. Based on comments logged to date, EPA has received in excess of 23,000 pages of comments from 5,713 respondents on the proposed Guidance. Many of these comments provided information and data that will improve the Agency's costs and benefits assessments. EPA is evaluating these comments and supporting data prior to revising the costs and benefits methodologies, and preparing the final Guidance.

Reductions in Bioaccumulative Chemicals

EPA is working with the Great Lakes States and the public to evaluate current sources and pathways of toxic substances entering the Basin and to identify any gaps in existing programs to achieve further reductions. The goals of the Great Lakes Toxic Reduction effort are to establish a consistent approach across all media to reduce loadings of toxic pollutants and where possible to accelerate actions to achieve reductions. This effort is targeted at BCCs: the chemicals most likely to exert Basin-wide effects if released.

This effort, in conjunction with the numeric water quality criteria and values, implementing procedures and antidegradation policies established through the final publication of the Guidance, will provide EPA, States and Tribes with an integrated, comprehensive framework for reducing toxic loadings to the Great Lakes.

Pollution Prevention

Consistent with the goals of the Pollution Prevention Act of 1990, EPA developed the Great Lakes Pollution Prevention Action Plan in April 1991. The Action Plan highlights how EPA, in partnership with the States, will incorporate pollution prevention into actions to reduce the use and release of toxic substances in the Great Lakes Basin. One of the most important pollution prevention projects is the "Auto Project," which is a voluntary agreement between Chrysler Corporation, Ford Motor Company, and General Motors Corporation, and the State of Michigan, on behalf of the eight Great Lakes States and USEPA. Each Company is surveying its plants in the Great Lakes Basin to establish priorities for reduction of generation and release of 65 persistent toxics. Releases of these toxics as measured in the Toxics Release Inventory, are on a downward trend, showing a 20% reduction. Over the 5-year period from 1988-92, releases have decreased on a production normalized basis from 2.71 lbs. per vehicle to 1.97 lbs. per vehicle.

Assessment and Remediation of Contaminated Sediments

Contaminated sediments, an undesirable legacy of the industrial era, creating both environmental and economic impacts, are a significant source of loadings of toxic pollutants at harbors and river mouths throughout the Great Lakes system. They are identified as environmental problems in 42 of the 43 Areas of Concern. The 1987 CWA authorized a five-year demonstration program to identify and develop assessment and treatment technologies for contaminated sediments in the Great Lakes Basin. This program is known as the Assessment and Remediation of Contaminated Sediments (ARCS) program.

The ARCS Program used an integrated approach involving over 40 agencies and organizations in the demonstration of state-of-the-art methods for assessing the toxicity of the sediments, applying mass balance models to predict the benefits from a range of clean-up scenarios, and conducting bench and on-site pilot demonstrations of remediation technologies. The ARCS Program is being completed this year. The Report to Congress is undergoing final OMB review.

Nutrient Reduction

One of the earliest indicators of the pervasive effects of chemical pollution on the Great Lakes and the first to elicit a broad public outcry was nutrient contamination. Lake Erie was the first of the Great Lakes to demonstrate a serious problem because it is the shallowest, warmest and naturally most productive. In response to public concern, new pollution control laws were adopted in the United States and Canada to deal with water quality problems, including phosphorus loadings to the lakes. Also, in 1972 both countries signed the first Great Lakes Water Quality Agreement to begin a binational Great Lakes clean-up that emphasized the reduction of phosphorus entering the Lakes.

In 1983, Canada and the United States approved a supplement to the GLWQA, confirming the maximum phosphorus loads the Lakes could tolerate.

Today phosphorus loadings to the Lakes have been reduced by well over 90% through: regulation and financial assistance, primarily for upgrading sewage treatment plants; reductions in industrial discharges; and, phosphorus bans in domestic laundry detergents imposed by the Great Lakes States. The Lakes have responded as expected. Lake Erie, once termed "North America's Dead Sea", now supports a world-class walleye fishery and oxygen-depleted waters are confined to the deepest portion of the Lake only during late summer and early fall months. Current efforts are focusing on reducing agricultural inputs of phosphorus and other agricultural chemicals from nonpoint sources throughout the Great Lakes Basin. Since significant pollutants enter the Great Lakes system from many miles upwind, it is important to work on decreasing airborne pollutants from both within and outside the system.

Information Management

Public leadership and public participation is a cornerstone of the ecosystem management approach in the Great Lakes and elsewhere, and information is the key to unlocking the energy and enthusiasm of people who live in these places. Just as ecosystem management requires a fundamental shift in approach to environmental protection, supporting this approach requires a fundamental change in our strategy for accessing, using, and maintaining data. GLNPO has been working cooperatively with the Headquarters' Office of Information Resources Management, the Office of Water, and with the Gulf of Mexico Program Office staff to pioneer a new approach to information management that is specifically designed to support ecosystem management. The essential elements of this new approach are:

(1) data integration -- linking the data contained within EPA program systems (e.g., the Permits Compliance System (PCS), the Toxic Release Inventory (TRI), the Resource Conservation and Recovery Information System (RCRIS), and the Facility Information Data System

(FINDS)) with ambient monitoring data in a geographic context using a Geographic Information System (GIS); and

(2) data access -- displaying and providing integrated data and the tools needed to analyze and report the data, at the desk-top, to State and federal staff, and ultimately to the public.

GLNPO initiated this system development process by conducting extensive interviews with our State and federal partners to define a specific set of information needs to support their activities under the Great Lakes Program. We have made considerable progress towards our information management vision over the past two years. First, the Agency has successfully developed the basic hardware and software components of the GATEWAY/ENVIROFACTS system (Version 2.0) and GLNPO is the first field location to begin testing the system. Second, GLNPO has become an active participant in the Great Lakes Information Network (GLIN). GLIN was developed by the Ameritech Corporation and is administered by the Great Lakes Commission. This network, which is accessible over the INTERNET, will likely become the backbone of information sharing and exchange of Great Lakes environmental information in the years ahead.

Lakewide Management Planning

Lakewide Management Plans (LaMPs) are management tools called for under Annex 2 of the GLWQA and under Section 118 of the CWA. The goal of LaMPs is to restore beneficial uses to open waters of the Great Lakes. LaMPs are required to address and manage a whole lake watershed, taking into account pollutant loadings and other stressors in order to address beneficial use impairments. The LaMP process involves integrating the views of a variety of binational, federal, State, provincial, tribal, and non-governmental agencies, jurisdictions, and stakeholders. The work is carried out by "Lake Teams" comprised of federal and

State managers and each Lake Team works closely with a designated public forum during the development and implementation of the LaMP. LaMPs are under development for Lakes Superior, Michigan, and Ontario, and a framework for proceeding with the LaMP for Lake Erie is being completed.

Remedial Action Plans

Remedial Action Plans (RAPs) are called for under Annex 2 of the GLWQA and, for AOCs within the United States, are mandated under Section 118 of the CWA. RAPs are a watershed-scale, multi-media approach to identify impairments and restore the beneficial uses of the Areas of Concern (AOCs). The nature of the environmental problems in these local areas again requires the integration of a number of federal, State, and local agencies within the planning framework. The RAP program itself is a model of grassroots environmental democracy, stressing empowerment of the affected public within the AOCs. State agencies have the lead responsibility for RAP development and implementation, and different States have approached the RAP programs in differing ways. The most successful RAPs are those that are ***community driven***, i.e., the public is actively involved in defining the environmental objectives for the AOC and in developing the means to achieve those objectives. The concepts used in LAMPs and RAPs were transferred to the Chesapeake Bay Program and utilized for development of the Bay's tributary plans. These concepts may be primarily transferable to the Gulf of Mexico program.

FUNDING IN SUPPORT OF THE GREAT LAKES PROGRAM

Resources to support the Great Lakes Program primarily come through legislative authorizations and appropriations at the federal and State levels. Within EPA, three funding sources have primarily supported the Great Lakes Program:

(1) a line item budget established following the 1987 Clean Water Act

amendments that is administered by GLNPO;

(2) Coastal Environmental Management (CEM) funds administered by the Office of Water and Regions 2, 3, and 5; and

(3) funds provided in support of the Great Waters Program under Section 112 of the Clean Air Act Amendments of 1990.

In addition to these specific funds, additional support for Great Lakes priority actions comes through the annual program planning process and the targeting of "base" EPA program activities. Other federal agencies have direct appropriations to support Great Lakes work and also target base funds through the annual program planning and budgeting process. Currently, in the Gulf of Mexico program, funds are allocated from Agency base program resources.

The States have been very active in supporting the Great Lakes Program. Over the past several years, the majority of State legislatures in the Great Lakes Basin have approved contributions into the Great Lakes Protection Fund. The goal of the Fund is to be capitalized at approximately $100 million. While currently short of this goal, interest on the current Fund is used to support State programs and to support grants to organizations that undertake specific projects meeting specific evaluation criteria.

In addition to federal and State resources, nongovernment organizations and private sector funds are active in supporting environmental protection activities and studies throughout the Basin. A key aspect of the ecosystem management approach, and an important element in the success of the Great Lakes Program, is creating opportunities to identify common environmental objectives and then leveraging public and private resources to accomplish these objectives. The Year of the Gulf in 1992-93 and the Gulf Foundation helped expand from public to

private sector resources. The Gulf of Mexico has a fledgling foundation with similar goals, but no line item funding.

THE GREAT LAKES PROGRAM -- OTHER REGIONAL PROGRAM SUGGESTIONS

Mr. Chairmen, as you deliberate the most appropriate course of action in establishing programs for other regional bodies of water and for the Gulf of Mexico, you are fundamentally considering how to put ecosystem management into practice across the nation. The Great Lakes Program has identified these overarching principles that we encourage you to consider:

(1) Government activities must be driven by the issues that confront the preservation of natural systems and the economies founded upon them. This means that the protection of ecosystems cannot be viewed as a separate task existing on the margins of environmental protection, or as a special initiative imposed from above. We must use the issues threatening natural systems -- specific places -- to drive the agenda and align our policy, planning, budgeting, and information systems accordingly. In the Gulf, eight key issues have already been clearly identified and are being used to drive budgets to address priority projects in each of these eight action areas.

(2) Regardless of scale, i.e., whether the focus of attention is the protection and restoration of large systems, such as the Great Lakes or the Gulf of Mexico, or smaller watersheds, ecosystem management requires coordinated, integrated action among many partners, federal, state, tribal, and local agencies; between government and private enterprises (e.g., non-government organizations and industry); and most importantly between government and the people governed for whom services are being provided. Many environmental, social, and economic problems of today are intertwined and beyond the purview

of any one program or organization. Public involvement and public leadership are cornerstones of the ecosystem approach to environmental protection.

(3) If public leadership is critical to success, information is the key to empowerment and to move communities to action. The availability of quality information on the resource to be protected or restored is essential. Whereas, our traditional approach to environmental protection spawned rules for an agency to follow, the ecosystem approach calls for dedication to flexibility and to strategically responding to the best information on the needs of the resource and the community dependent on that resource. This means that we must expand and improve our data collection efforts, consider information a treasured resource in its own right, and integrate and make more accessible government information systems. Further, we must forge a stronger link between the scientific community and the information technology community, so their work is aligned with the needs of these very special places which are the focus of your deliberations.

These principles: the ability to focus on the needs of the ecosystem and the communities dependent on that ecosystem and to work at different scales of geographic resolution, depending on the scale of the problem to be addressed; the ability to engage a broad range of public and private, government and nongovernment constituencies in creating an environmental and economic vision for the region; and the ability to effectively collect and manage scientific and programmatic information in order to empower the public and inform the decision-makers must be central to efforts aimed at protecting and restoring our Nation's ecosystems.

Finally, establishing GLNPO by statute and providing line-item budget

accountability has ensured a higher level of EPA attention and commitment to the Great Lakes Program. However, I believe that the approach currently taken by EPA in constructing the Gulf Program as a collaborative partnership of federal and state agencies, with stakeholder involvement is an improvement. However, in order to effectively coordinate activities among Federal agencies, there needs to be sufficient flexibility in the various statutes to allow the agencies to target and fund activities addressing the most significant problems and issues in the region.

CONCLUSION

Mr. Chairmen, I hope my testimony has been of assistance to your very important deliberations. The steps you take could very well help steer the course for an ecosystem approach to environmental protection and sustainable community development. I would be pleased to provide any additional supporting information on the Great Lakes Program at your request.

TESTIMONY OF
ALFRED M. BEETON
DIRECTOR, GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

BEFORE THE
SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF

AND THE

SUBCOMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES
COMMITTEE ON MERCHANT MARINE AND FISHERIES
U.S. HOUSE OF REPRESENTATIVES

March 24, 1994

Mr. Chairman and Members of the Subcommittees:

I am Alfred Beeton, Director of the Great Lakes Environmental Research Laboratory (GLERL) of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, Ann Arbor, Michigan. I appreciate the opportunity to discuss progress being made toward the informed, cost-effective, and sustained management and protection of the Great Lakes Basin Ecosystem. There are many lessons to be learned from both the successes and the setbacks that we in the Great Lakes region have seen over a history of activity that dates back to the Boundary Waters Treaty signed by the United States and Great Britain in 1909.

The use of the Great Lakes experience as a model for development of regional programs elsewhere is a sound, prudent approach and one which parallels President Clinton's theme of "reinventing government." In the Gulf of Mexico and other regions of the

United States, focused, high-quality environmental science coupled with aggressive management and informed policymaking will do much to ensure the sustainability of a region's resource base. Another model for ecosystem management is the ten-year old Chesapeake Bay Program which has joined three states, the District of Columbia, and numerous Federal agencies in a joint restoration and protection effort. Beyond that, we need to take an ecosystem approach in both our science and in our decisionmaking to get maximum returns from applied resources. Secretary of the Interior Bruce Babbitt characterized ecosystem management as a promising way of averting what he called "environmental train wrecks" that threaten our Nation's environmental quality and economic vitality.

Fundamentally, the ecosystem approach is one founded on the recognition that physical, chemical, and biological processes are intimately linked and greatly affected by human activities. That being the case, preventive action to manage and protect Great Lakes resources is preferred in a context that recognizes the responsive and self-regulating properties of the ecosystem. In 1978, the U.S. and Canadian governments approved revision of the binational 1972 Great Lakes Water Quality Agreement (GLWQA) to include language within Article II stating that:

> "The purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. In order to achieve this purpose, the Parties agree to make a

maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System."

In its *Second Biennial Report* (December 31, 1984), the International Joint Commission (IJC) the binational body charged with administering the GLWQA, described the 1978 Agreement as:

> "...a milestone document, one of the first international statements that technical, diplomatic, and administrative approaches to resource management need to be considered in terms of holistic ecological concepts. Land, water, air and biota interact and are mutually influenced."

In spite of the bold, innovative approach advocated by the 1978 GLWQA, little progress was made in implementing an ecosystem approach within a basinwide perspective. A 1985 binational report by Canada's Royal Society and the U.S. National Research Council observed that:

> "The 1978 Agreement has not served as a stimulus for further rapid progress with respect to the ecosystem approach. The years since the Agreement was signed may ultimately be seen as a maturation period, leading in future years to strong advances in ecosystem management for large systems."

In subsequent years, the difficulties in applying an ecosystem approach to guide resource management in the Great Lakes Basin were examined by investigators from a wide array of disciplines and a considerable body of literature was compiled in scientific journals, special reports and publications. Overall, some of the largest obstacles in the path of implementing an ecosystem approach are institutional in nature and might be overcome by institutional review and adjustment with the recognition (Donahue 1988) that:

> "The perceived absence of an ecosystem approach to Great Lakes management is not necessarily a failure of existing institutions; they simply were not designed with that purpose in mind. Given their generally broad mandates, however, integrating such an approach into their present functions is an opportunity that warrants thorough investigation."

Apart from institutional adjustments, there has been an ongoing effort in the Great Lakes community to more clearly define and clarify the inherent objectives of the "ecosystem approach" and related terms. MacKenzie (1993) distinguished the ecosystem approach from previous Great Lakes water planning and management efforts in that the ecosystem approach had:

> (1) "*A primary focus on ecological integrity.* The objective of the ecosystem approach is to protect the integrity of the natural system. As such, the

alleviation of physical stresses on a natural system is a prime goal.

(2) *A perception of the ecosystem as self-sustaining.* The ecosystem approach embraces the notion that humans and the environment coexist in an interactive ecological system which has threshold limits to stress tolerance and responds synergistically to external influences.

(3) *A natural ecological boundary.* The ecosystem boundary is determined by the nature of the resource to be managed rather than the arbitrary jurisdiction of a political unit. Within the ecosystem, all biological, physical, and chemical matter exists in a complex relationship of interdependence.

(4) *A holistic orientation toward resource management.* The ecosystem approach recognizes that all elements of the system should be planned for in unison. Water, forestry, air, and wildlife concerns should be balanced with issues such as land use and industrial development in order to develop an ecologically sustainable socio-physical system. Thus the ecosystem approach moves from a reductionist single-purpose orientation to a more holistic and inductive form of resource management."

The 1987 Amendments to the Great Lakes Water Quality Agreement greatly expanded its scope. The 1987 Amendments require the

development and the implementation of Lakewide Management Plans with emphasis on toxic pollution control for each of the Lakes. The Amendments provide important new frameworks for bilateral work on wetlands, contaminated sediments, and airborne toxic substances. This expansion of GLWQA has been a major step in moving the two countries toward more systematically addressing overall Great Lakes ecosystem issues.

In June 1993, the Ecological Committee of the IJC's Great Lakes Science Advisory Board released an initial report - *The Ecosystem Approach: theory and ecosystem integrity*. It discussed key aspects of the ecosystem approach including dynamics, structure, scale and perspective, while considering human inclusion and intervention in various roles. Scale and perspective were also viewed as important elements in assessing ecosystem integrity. The report concluded that: "Appropriately applied, the ecosystem approach is good science leading to fitting and ecologically well-informed policy" but recommended that ..."The Great Lakes Science Advisory Board -- when it addresses the Great Lakes Basin Ecosystem in offering advice -- make clear <u>at the outset</u> what process or processes of system definition and system delimitation it is using."

Clearly, much work remains to ensure adoption of an ecosystem approach among Great Lakes stakeholders and across diverse institutional jurisdictions. One encouraging development has been an initiative led by the Great Lakes Commission

(representing the Great Lakes States) that seeks the signing of a Great Lakes Ecosystem Charter by U.S. and Canadian Federal governments, governments of the Great Lakes States and two Canadian Provinces, and non-government organizations and other stakeholders throughout the region. Approval of the Charter should heighten commitment to ecosystem management and hopefully will speed progress in defining and supporting a singular approach.

Beyond promoting an ecosystem approach, the Great Lakes Water Quality Agreement has influenced subsequent legislation in the United States including RCRA, CERCLA, major CWA and CAA Amendments in 1990, and implementation of NEPA. Within the Clean Water Act, section 118 specifically recognizes U.S. responsibilities to work toward goals of the GLWQA. In addition, the GLWQA reminded states and provinces of their shared interests as stakeholders in the Great Lakes Basin, leading to several other agreements.

The Great Lakes Charter (1985)

In 1986, the Great Lakes Charter was signed by the eight governors of the Great Lakes states and the premiers of Ontario and Quebec. The purpose of the agreement was to: (1) conserve the levels and flows of the Great Lakes system; (2) protect the environmental balance of the Great Lakes ecosystem; and (3) make secure the present developments within the Great Lakes region. The Charter was prompted by several proposals in the early 1980's

that sought to divert waters of the Great Lakes/St. Lawrence River for use in other regions.

The Great Lakes Toxic Substances Control Agreement (1986, 1988)

The Great Lakes Toxic Substances Control Agreement was signed by the Great Lakes states in 1986 and the provinces of Quebec and Ontario in 1988. The Agreement embodied a basinwide commitment to protect Great Lakes water quality by monitoring toxic substances in the Lakes, furthering research into the effects of these substances, and encouraging cooperative action between states and provinces to attain such goals. Recommendations within the Agreement provided for initiatives addressing toxic pollution prevention.

The Great Lakes Commission

Established in 1955 by joint legislative action by the eight Great Lakes states, the Great Lakes Commission strives "to promote the orderly, integrated, and comprehensive development, use and conservation of the water resources of the Great Lakes Basin" (Article I, Great Lakes Basin Compact). Principal functions of the Commission include: (1) information sharing among the Great Lakes states; (2) coordination of state positions on issues of regional concern; and (3) advocacy of those positions on which the states agree. Environmental protection, resource management, transportation, and economic development are examples of issues the Commission commonly addresses in a committee/task force structure to identify and develop positions.

The Ecosystem Framework

Ecosystems are complex and any significant changes in one component, whether it be physical, chemical, or biological, can result in perturbations causing the system to seek a new equilibrium. In order for wise decisions to be made, which are compatible with sustainable development, knowledge needs to be interpreted from various disciplines and made available to decisionmakers in a useful manner. The approach being developed for the Great Lakes Basin is the Ecosystems Framework, which will aid the International Joint Commission in evaluating policy options and in setting research priorities. The Framework will be useful in coordination of research and for selecting options for sustainable development, which will maintain ecosystem integrity compatible with economic growth.

Interagency Cooperation in Ecosystem Management (ICEM)

ICEM is a consortium of 20 midwestern state and Federal agencies which have made a commitment towards ecosystem management. The consortium was formed when a Resolution of Cooperation was signed in November 1991. Six workgroups have been undertaking the following activities:

(1) Ecological Mapping: i.e., agreement on a system to map ecological units in the midwest and to develop maps;

(2) Information systems: develop ways to share data and geographic information systems (GIS);

(3) Landscape planning and demonstration projects: i.e.,

development of complimentary management strategies for major blocks of public lands managed by different agencies;

(4) Monitoring and assessment: i.e., development of approaches and methods to assess, maintain, and restore ecosystems and biodiversity on a regional scale;

(5) Research: identification of present and needed ecosystem research; and

(6) Education: development of mutually supportive programs on ecosystem management for agencies and the public.

The Great Lakes Fishery Commission

Established under the United States/Canada 1955 Convention on Great Lakes Fisheries, the Great Lakes Fishery Commission began operation in 1956 with the mission of: (1) developing coordinated research programs in the Great Lakes and, based on their findings, recommending measures to ensure sustained productivity of fish stocks; and (2) formulating and implementing a program to eradicate or minimize Great Lakes sea lamprey populations.

Great Lakes United

Great Lakes United (GLU), formed in 1982, is a broad-based coalition of 195 U.S. and Canadian groups and organizations representing environmental, labor, tribal, governmental, educational, commercial and civic interests in the Great Lakes - St. Lawrence River region. GLU organizations are united by a common interest in conservation, proper management, and

protection of the Great Lakes-St. Lawrence River Ecosystem. Policy resolutions developed, discussed and adopted during annual GLU meetings form the basis of coalition issue positions. Critical issues identified by GLU include: (1) water quality; (2) hazardous and toxic substances; (3) atmospheric deposition; (4) regulation of lake levels and flows (including diversion questions); (5) fish and wildlife management and habitat protection; (6) land quality and use; (7) navigation issues (including winter navigation and locks/channel modification); and (8) public support for Great Lakes ecosystem research, education, and management.

Great Lakes Research

Although serious threats to Great Lakes resources, such as the sea lamprey's depletion of lake trout stocks, prompted some focused scientific research to solve problems, the GLWQA and the subsequent ecosystem approach it defined led to expansion of scientific research throughout the basin. The establishment of GLERL, in fact, arose from the International Field Year for the Great Lakes (IFYGL), a binational effort by the United States and Canada to study Lake Ontario. The effective implementation of the ecosystem approach in managing Great Lakes resources depends fundamentally on a detailed knowledge of the interaction of physical, chemical and biological lake processes. The role of GLERL has been to study linkages and dynamics among these processes so that managers and policymakers might have sufficient data to make informed decisions.

In January 1993, NOAA established its Great Lakes Research Office (GLRO) at GLERL. The office was mandated under the Clean Water Act with the mission of compiling and reporting on the inventory of Great Lakes research activities, while working toward better research coordination and the elimination of unnecessary and costly duplication of effort. To date, the most extensive inventory carried out has been that of the International Joint Commission's Council of Great Lakes Research Managers, a body responsible for promoting interjurisdictional and multidisciplinary coordination and planning of research related to the implementation of the GLWQA. The Council publishes a Great Lakes Research Inventory document covering two-year intervals.

The International Association for Great Lakes Research (IAGLR) also constitutes another focal point for consolidating and communicating scientific information within the Great Lakes Basin. Established in 1967, IAGLR is a professional, non-profit scientific organization composed primarily of U.S. and Canadian scientists. The Association publishes the quarterly *Journal of Great Lakes Research* and holds an annual Great Lakes research conference.

Elsewhere in NOAA's Office of Oceanic and Atmospheric Research (OAR), Great Lakes Sea Grant Programs have taken advantage of partnerships among government, academia and the private sector in using research to solve problems in managing Great Lakes

resources. The Great Lakes Sea Grant Network includes cooperative programs of Illinois-Indiana, Michigan, Minnesota, New York, Ohio, and Wisconsin. Sea Grant features a network of advisory agents, researchers and communicators who provide the Great Lakes region with problem-solving and basic information needed for the sustained management of Great Lakes resources.

Conclusion

Overall, much has been accomplished toward building a responsive, coordinated, and cost-effective research infrastructure in the Great Lakes Basin ecosystem. This task has required unprecedented cooperation among eight Great Lakes states, and two Canadian provinces working across a wide spectrum of jurisdictions and interests. Is this "model" transferable to other regions of the United States? I believe that it is, given patient commitment and mutual trust among states in the region and any foreign nations with an interest in shared ecosystem resources. I would like to point out, however, that NOAA participates in other Great Water Body programs, such as in the Chesapeake Bay, that use different approaches and should be looked at. Any new process should build upon the cooperative ongoing efforts both in the region and between Federal agencies. In the Great Lakes Basin, the binational Great Lakes Water Quality Agreement has furnished a useful framework for the inventory, planning, and coordination of scientific research. Moreover, the GLWQA, through the International Joint Commission

encourages communication of research-derived knowledge to decisionmakers.

Regardless of geographical location, stakeholders in a particular ecosystem should fully acknowledge and support adequate scientific documentation and understanding of ecosystem structure and function. Sufficient data and accurate, reliable scientific analysis/synthesis are essential for defining a clear path toward sustained management of ecosystem resources.

This concludes my statement. I would be pleased to answer any questions the members of the Subcommittees may have.

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Great Lakes Commission

TESTIMONY BEFORE THE

SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF

AND

SUBCOMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES

COMMITTEE ON MERCHANT MARINE AND FISHERIES
U.S. HOUSE OF REPRESENTATIVES

March 24, 1994

10:00 a.m.

1334 Longworth House Office Building

Statement by:

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Introduction:

I am pleased to be here on behalf of the eight member states of the Great Lakes Commission to speak to the current status of programs, funding mechanisms, regulations, and information networks that have been established with the intent to improve and protect the Great Lakes. This subcommittee is to be commended for its interest in examining the collective Great Lakes management experience as a model from which to draw in developing programs for other regional bodies of water.

We in the Great Lakes-St. Lawrence Basin (hereafter referred to as Great Lakes Basin) maintain a tradition of binational, multi-jurisdictional cooperation that dates back to the middle decades of the 19th century. We recognize that the environmental and economic significance of this Basin and it resources transcends our own political boundaries and spans this nation, North America and the entire globe. These resources, which include the largest system of fresh surface water on earth, have a national and global significance that demands the interest and support of citizens and members of Congress from coast to coast. The Great Lakes system is the worlds largest natural laboratory; the bellwether of scientific investigation. It is also the world's largest laboratory for institutional experimentation. What we learn here—from both our successes and mistakes—can form the basis of knowledge for future actions and management efforts elsewhere.

We in the Great Lakes Basin have long recognized the benefits of a hydrologic, or watershed-based, approach to resource management and environmental protection. Transcending the artificiality of political boundaries to manage resources and human behaviors on a watershed basis is a fundamental requirement of an ecosystem approach to Great Lakes-St. Lawrence management, or to management in any other region of North America and beyond.

In my remarks today, I will first offer descriptive information to place the Great Lakes Basin management effort in context from a physical, socio-economic and institutional context. I will follow with a series of observations or specific initiatives with potential applicability elsewhere. I will conclude with several observations—or parameters—that might be considered when developing regional water programs and associated institutional mechanisms elsewhere.

The Great Lakes Commission - An Overview

While each of you are undoubtedly acquainted with the purpose and programs of the Great Lakes Commission, I wish to begin my testimony with a brief background statement to provide a context for the items that follow.

The Great Lakes Commission is an interstate compact agency with a legislative mandate to represent the collective views of the eight Great Lakes states before Congress and the federal government. The Commission was established in 1955 under state statutes and granted Congressional consent in 1968 via P.L. 90-419, the Great Lakes Basin Compact. The Compact directs the Commission to "promote the orderly, integrated, and comprehensive development, use and conservation of the water resources of the Great Lakes basin."

The Commission is comprised of governors' appointees, state officials and legislators from its member states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin). It is

funded in part by annual dues from member states, and stands ready to assist and represent them on issues and opportunities of shared interest.

We at the Great Lakes Commission share a resource management philosophy that influences every aspect of our work. To summarize, we recognize that:

- Regional economic development and environmental goals are not mutually exclusive. They are inseparable and must be pursued in concert to achieve the region's full potential.

- The eight Great Lakes states, acting collectively through the Great Lakes Commission, have a principal stewardship responsibility for the precious and irreplaceable resources of the Great Lakes Basin.

- Management of the Great Lakes is of both national and regional interest: it is neither the exclusive responsibility of the states nor the federal government. Rather, a federal/state partnership must be sustained and nurtured.

- The Great Lakes, despite their vastness and resilience, are a finite and fragile resource. Maintaining their integrity is a sound and necessary investment in the region's economy and environment, as well as the health, welfare and quality of life of its citizens.

The Commission pursues its mandate via three functions: information sharing among its member states; coordination of state positions on regional issues; and advocacy of those positions on which the states agree. A wide range of environmental, resource management and economic development issues are addressed. In so doing, the Commission works closely with Great Lakes governors; state legislators; members of the Great Lakes Congressional Delegation; municipal, state and federal agencies; interstate organizations; private sector firms and associations; universities; colleges and individual citizens.

The Physical Dimensions of the Great Lakes Basin

Expansive and intensively used, the resources of the Great Lakes Basin enjoy global prominence. The Basin contains some 65 trillion gallons of fresh surface water; a full 20% of the world's supply and 90% of the United State's supply. Its component parts -- the five Great Lakes -- are all among the fifteen largest fresh water lakes in the world. Collectively, the Lakes and their connecting channels comprise the world's largest body of fresh surface water. They lend not only geographic definition to the region, but help define the region's distinctive socio-economic, cultural and quality of life attributes as well.

An international resource shared by the United States and Canada, this system encompasses 95,000 square miles of surface water and a drainage area of almost 300,000 square miles. Extending some 2,400 miles from its western-most shores to the Atlantic, the system is comparable in length to a trans-Atlantic crossing from the east coast of the United States to Europe. According to the Great Lakes Basin Framework Study, the U.S. portion of the Basin alone contains almost 250 species and subspecies of fish; over 180,000 acres of coastal wetlands; almost 40 million acres of forested land and 32 million acres of agricultural land.

Lake Superior is the largest of the five Great Lakes and, by surface area, is the largest freshwater lake in the world. Extending some 350 miles from the northeast shores of Minnesota to the northwest shores of Ontario, Lake Superior is 160 miles in breadth at its widest point, encompassing 31,700 square miles of surface water within a coastline approaching 3,000 miles in length. The deepest of the Great Lakes (1,333 ft.) with an average depth of 489 feet, Superior contains almost 3,000 cubic miles of water. Due to this volume and its relatively constrained outlet (St. Marys River to Lake Huron), Superior has a retention time of 191 years; twice that of Lake Michigan and almost two orders of magnitude longer than Lake Erie. The drainage basin totals 81,000 square miles and encompasses portions of Michigan, Minnesota, Wisconsin and Ontario. Approximately 700,000 citizens of the United States (79%) and Canada (21%) reside within the drainage area.

Lake Huron is the second largest of the Great Lakes and one of two shared (on the U.S. side) by only a single state (in this case, Michigan). Extending just over 200 miles from the Straits of Mackinaw to the headwaters of Lake St. Clair, Lake Huron is 183 miles across at its widest, with an average depth of 1,956 feet and a maximum depth of 750 feet. Its shoreline totals 3,180 miles in length. The Lake Huron basin has a large land to water ratio relative to the other Great Lakes; its 74,800 square miles of land are approximately three times the total surface water area. Lake Huron's retention time is just over years. Within the basin resides a population of 2.26 million; almost 60% of whom reside on the U.S. side.

Lake Michigan, the third largest of the Great Lakes, is the only Great Lake entirely within the geographic boundaries of the United States. Hydrologically inseparable from Lake Huron, it extends over 300 miles from the northern coasts of Illinois and Indiana to the Straits of Mackinaw. Approximately 118 miles in breadth with an average depth of 279 feet (923 ft. maximum), Lake Michigan contains approximately 1,180 cubic miles of water. The land mass within the basin is approximately twice as large as the 22,300 square miles of water surface it drains and includes portions of Illinois, Indiana, Michigan and Wisconsin, collectively accounting for 1,660 miles of shoreline. A population of 14 million resides within the Lake Michigan drainage basin -- far more than that of any other Great Lake. Retention time for the Lake's water volume is just under 100 years.

Bordered by four states and a province, Lake Erie is the fourth largest of the Great Lakes. Despite its size (length - 241 miles, breadth - 57 miles), and relative shallowness (average depth of 62 feet), explains the fact that it yields the smallest volume of the five Great Lakes (116 cubic miles). Its retention time is but 2.6 years. The Lake's surface area is just under 10,000 square miles and is surrounded by 856 miles of shoreline. The most densely populated of the five Lake basins, almost 13 million U.S. and Canadian citizens reside in the Lake Erie drainage basin. The preponderance (88.8%) reside on the U.S. side.

Lake Ontario, the smallest of the Great Lakes in terms of surface area, is bordered by the province of Ontario on the north and west and New York on the south and east. While similar to Lake Erie in length and breadth (193 and 53 miles respectively), Lake Ontario's greater average depth (283 feet) yields almost four times Erie's volume (393 cubic miles) and three times its retention time (six years). Lake Ontario's surface area is 7,340 square miles; its drainage area is approximately four times as large. A population of just over six million resides in the basin; approximately two-thirds of these residents area located on the Canadian side. Lake Ontario's coastline is approximately 726 miles in length.

Also of significance in characterizing the physical attributes of the system are the connecting channels. The St. Marys River is the northernmost of these, a 60 mile-long waterway providing an outlet for Lake Superior and contributing an average of 75,000 cfs of its waters to the lower four lakes. The St. Clair and Detroit Rivers - and Lake St. Clair between them - form an 89 mile long channel connecting Lakes Huron and Erie. At its outlet, the Detroit River flows at an average rate of 186,000 cfs into the western basin of Lake Erie. The Niagara River, linking Lakes Erie and Ontario, continues on for 35 miles, with an average flow of 50,000 cfs over the Niagara Falls. The St. Lawrence River, in providing the linkage between the Lakes proper and the Atlantic, is one of the world's premier waterways, extending some 383 miles as it caries an average of 240,000 cfs of water to the Atlantic ocean.

By any measure, the Great Lakes system is of global significance, an expansive and interconnected system of lakes and connecting channels that collectively define one of the most dominant physical features on the face of the earth. The size, configuration and biological diversity of this system gives rise to its multiple use properties, its environmental and economic significance, and the complexity and gravity of public policy issues concerning its use, development and protection.

The Socio-economic Dimension

The role of the Great Lakes system in advancing regional, national and binational economic development has been recognized (but not fully appreciated) for many decades. The mere physical presence and geographic configuration of the system and its attendant attributes was, and continues to be a determinant of locational decisions for business and industry. Much of the early economic activity during settlement of the region was directly attributable to resource exploitation potential (e.g., fisheries, trapping, mining, forestry) and the availability of water-based transport. While the current industrial base is more diversified, the Basin's water resources continue to exercise a substantive role in the attraction and retention of industry. Growing concerns over depletion of the Ogallala aquifer, as well as anticipated water shortages in southwest regions of the United States, have prompted some researchers to predict a dramatic resurgence of water-dependent industry in the Great Lakes St. Lawrence Basin. While such predictions are based as much on speculation as fact at the present time, they do illustrate the economic utility of the water resource, and the attendant need to devise water management and economic development strategies sensitive to that utility.

The regional economic impact of the Great Lakes system is pervasive but can generally be attributed to its standing as a mode of transport; a factor of production; a "supporting" resource; and a "marketable amenity".

Great Lakes system potential as a mode of transport has long been recognized and actively pursued by both the United States and Canada. Historical analysis indicates that development of the system's transportation potential was a driving force behind physical infrastructure decisions and helped shape development of many regional resource management institutions and practices.

In the United States, a federal interest in the Great Lakes system was initially articulated in the Northwest Ordinance of 1787, which declared the navigable waterways into and between the St. Lawrence and Mississippi Rivers to be common highways and forever free. That same year, Congress authorized payment for construction of lighthouses, beacons, public piers and related facilities, an

action that further established the federal interest in water resources. Ten years later, the first navigational improvement to the system was recorded when the North American Fur Company constructed a small lock on the St. Marys River at Sault Ste. Marie. Further recognition of the system's transportation potential was demonstrated in 1822, with Congressional authorization of a canal to connect the Illinois River with Lake Michigan. Two years later, the Congress enacted the first of an extensive series of River and Harbor Acts authorizing physical improvements to the navigation system. An extensive history of such improvements by both countries is highlighted by the intensive development of the Welland Canal in the late 1920's and early 1930's, the construction of the St. Lawrence Seaway in the 1950's and the completion of the Poe Lock at Sault Ste. Marie in 1970, among others. A review of the developmental history of the Great Lakes transportation system over the past two hundred years, including the many significant events not identified here, yields a portrait of a regional economy born of and shaped by the presence of the Great Lakes system.

The transportation potential of the Great Lakes system was also a catalytic force in the early development of regional resource management institutions. The initial call for a permanent, international body to address Great Lakes St. Lawrence issues was an outgrowth of continuing negotiations between Secretary of State Elihu Root and Canadian Prime Minister Sir Wilfred Laurier in the final decade of the 19th century. In 1895, the two countries established a Deep Waterways Commission to investigate the feasibility of constructing a seaway to permit transportation access to the Atlantic. This entity later developed into the International Joint Waterways Commission (1903), a precursor of the International Boundary Waters Treaty of 1909 and its implementing agency, the International Joint Commission. More recently, the formation of the Great Lakes Commission was prompted by an emerging sense of regionalism among Great Lakes states brought about in large part by the impending opening of the St. Lawrence Seaway. Numerous other regional organizations - both public and private - have emerged as well, aided by the existence of a waterborne transportation system that demonstrated the interconnectedness of the Lakes and the jurisdictions that surround them.

According to the St. Lawrence Seaway Development Corporation, well over a billion metric tons of cargo, with a value of more than $200 billion, have moved through the Seaway to and from ports in North America, Europe, Asia, Africa and the Middle East. The cumulative impact of Seaway usage on local economies has been established at over $3 billion per year.

A second means of examining the economic aspects of the Great Lakes system is from the perspective of water as a factor of production, including both consumptive and non-consumptive uses. As determined by the International Joint Commission, the seven principal consumptive use sectors in the Basin, in descending order of magnitude, include manufacturing; municipal; power generation; irrigation; rural-domestic; mining and rural stock. Non-consumptive uses include in-stream use, cooling water and any other use where the water withdrawn is returned to the Basin.

According to the Regional Water Use Data Base Repository maintained by the Great Lakes Commission, water use in 1991 (instream and withdrawals) totaled 945.4 billion gallons per day. Almost 60 percent originates from Great Lakes system proper, with the balance drawn from tributaries and groundwater. The largest single category by far is self supply - hydroelectric, an instream use that represents more than 94% of the total water usage per day. Of the 56.8 billion gallons actually withdrawn from the Basin each day, about 96% is returned. Consumptive uses account for approximately 2.5 billion gallons per day, but are expected to increase in future years, largely in the manufacturing, irrigation and power generation sectors. Such increases have captured the attention and

concern of the International Joint Commission, with measurable impacts upon lake levels and competition\conflict between water users identified as potential scenarios.

The Great Lakes system as a "supporting resource" is a third means of categorization that broadens understanding of their economic importance. For purposes of this discussion, a "supporting resource" is one that has not only an economic value unto itself, but by virtue of its characteristics, supports the existence of other natural resources with an economic value (e.g., the fishery, waterfowl populations, wetland resources, regional climate).

The economic importance of these and other lake-based natural resources is not to be underestimated. The Basin's substantial waterfowl population, for example, is due largely to the existence of the Basin's water resources and is responsible for generating substantial economic benefits through hunting related revenues alone. The Basin's wetlands serve important functions in groundwater recharge, flood and erosion control, thermal exchange, sediment and nutrient traps, and fish and wildlife habitat. While the value of such functions is difficult to quantify in economic terms, the contribution of wetlands to recreational/commercial activities (e.g., hunting, fishing, nature observation) is significant, conservatively estimated by the House Merchant Marine and Fisheries Committee at $10 billion nationwide. Great Lakes wetland resources contribute substantially to this figure. Finally, the "lake effect" characteristics of the region's climate have a tempering impact upon seasonal temperatures. The impact is economically favorable, with specialty crop production and overall agricultural productivity benefiting.

Water as a "marketable amenity" provides as a fourth and final perspective on the economic value of the Great Lakes system. Of concern here are non-consumptive, in-Basin, and essentially non-manipulative uses of the water resource that generate regional and international economic benefits. Examples include, among others, water-based recreation, quality of life factors and, in a more general sense, the aesthetic value of the resource.

Water-based recreation is an exceedingly broad category encompassing the more obvious recreational activities (e.g., boating, fishing, swimming) as well as those where the presence of the Great Lakes system plays a more subtle, yet significant role (e.g., nature observation, hiking, sightseeing). Individually and collectively, the contribution of these activities to the regional economy is staggering. For example, sport fishing, recreational boating and water-based tourism are all multi-billion dollar industries in the Great Lakes states.

The attributes of the Great Lakes system also factor significantly into "quality of life" considerations. The presence of these resources influences locational decisions (business and residential), recreational preferences, and in a more general sense, overall living patterns. The economic implications of a favorable "quality of life" environment are difficult to quantify but unquestionably substantial.

The aesthetic value of the system is a subset of this "quality of life" consideration. An individual places a value on the resource, not as a function of its present or potential economic utility, but its contribution to their personal enjoyment and overall sense of well-being. The aesthetic value of the Great Lakes system is shaped in large part by the magnitude of its physical dimensions and diversity of attributes. The extent of the aesthetic appeal of the resource can be measured only imperfectly by approximate "shadow-pricing" methods (e.g., property values, tourism patterns), but is nonetheless an indicator of the contribution of the Great Lakes system to the regional economy.

The Institutional Infrastructure for Basin Management

As a shared, multi-purpose resource, the Lakes are intensively used and managed at every level from the local to international arena. Eight states and two Canadian provinces share the Basin. Literally hundreds of governmental entities are charged with management of some aspect of the resource, including municipalities, county health boards, state and provincial departments of natural resources, planning and conservation districts, over a dozen federal agencies (American and Canadian) and several international bodies as well. Most are limited in management authority to a defined political jurisdiction and/or a specific management function (e.g., water supply, flood control, water quantity). Yet, singly and collectively, they contribute to the status of the resource and therefore, influence binational relations. Further, a constellation of research institutes, citizen groups, business/labor organizations, policy centers, foundations, and special interest coalitions have flourished as well, using the various access points to government institutions to influence the direction of Great Lakes policy and management activity.

Treaties, agreements, memoranda of understanding and diplomatic exchanges between and among state, provincial and federal governments in the United States and Canada have frequently been employed in the Great Lakes policy process. For example, a series of treaties dating back to the Treaty of Paris in 1783 have been employed to address binational issues between the United States and Canada. The International Boundary Waters Treaty of 1909 emerged as the culmination of early joint initiatives, and remains today as the principal guide for Canada-United States relations on Great Lakes water quality and quantity issues.

The Canada-United States Great Lakes Water Quality Agreement, signed by the two federal governments in 1972 and subsequently amended in 1978 and 1987, provides for the development and implementation of programs to control municipal and industrial water pollution sources; work toward elimination of toxic substance discharges; identify various non-point sources of pollution; improve monitoring and surveillance; and carry out other functions. At the inter-state/provincial level, the Great Lakes Charter (1985) and Great Lakes Toxic Substances Control Agreement (1986) are examples of cooperative agreements among the Great Lakes governors and premiers.

Memoranda of understanding are a "step down" from an agreement in terms of formality and political consequence. They are available to (and among) federal, state and provincial governments. At the federal level, for example, an August, 1980 Memorandum of Intent established a joint Canada-United States approach to investigating the acid rain issue. At the state level, examples include transboundary air pollution Memoranda of Understanding between Quebec and New York, Quebec and Vermont, and Minnesota and Ontario. While Article I of the U.S. Constitution prohibits these devices from being binding agreements unless ratified by Congress, they serve as "good faith agreements" between two or more jurisdictions seeking remedy to a shared problem or as a consultation device for a shared issue. The two governments frequently exchange diplomatic notes or otherwise communicate on resource management issues of shared concern. These exchanges are as varied as the seemingly infinite array of transboundary issues that arise. These exchanges can be used as a precursor to the development of an agreement, treaty or other mutual understanding.

The complexity of this Great Lakes "institutional ecosystem" is a well-documented and readily observable phenomenon. Not surprisingly, charges of organizational inefficiency and redundancy have been leveled at the Great Lakes policy process over time. While justified in some cases, such charges

fail to recognize that complexity is not a "de facto" consequence of an inefficient process. Rather, institutional complexity is a fact of life defined by the nature of the resource and the diversity of its uses.

By virtue of its expansiveness alone, a complex, multi-jurisdictional management approach is assured. Until the rather recent emergence of the ecosystem management concept, the five Great Lakes and St. Lawrence River were considered to be, and therefore managed as, discrete hydrologic units. Consequently, the various management functions associated with the water and related land resources of the Basin were assigned in a piecemeal, issue-specific manner to the many established political jurisdictions.

Unlike most other major bodies of fresh surface water in North America, the Great Lakes system possesses certain properties that lend themselves to intensive multiple uses. The system provides, for example, a tremendous volume of high quality fresh water, accessibility by population and industrial centers; and a hydrologic configuration suitable for commercial transportation. Despite the long-standing diversity of resource uses, however, resource management at the governmental level tends to be compartmentalized and geographically confined. Within a given state or province, for example, separate departments or ministries may address water quantity, water quality, transportation, economic development or tourism concerns. The complexity increases by an order of magnitude when the management issue is a binational one.

The interface between hydrologic and political boundaries also breeds complexity. Water bodies have historically been perceived as convenient lines of demarcation between adjacent political jurisdictions rather than as shared and unifying resources. The Great Lakes system has, until rather recently, been viewed in such a light. As a result, for decades management institutions developed essentially independently on each side of the border before even the most rudimentary binational efforts were instituted.

The ecosystem approach to management is being increasingly embraced, in some manner, by the various units and levels of government in the Basin. Developing for over a century, yet not formally recognized in Great Lakes management until the 1978 Great Lakes Water Quality Agreement, this concept recognizes the interdependency of the physical, chemical, biological, and human processes within the Great Lakes system. As explained by the International Joint Commission's Water Quality Board, the concept "provides the philosophical framework and scientific rationale to grasp the notion that everything in the basin is related to and affects, to some degree, everything else in the basin."

In application, the ecosystem approach concept rejects a structured, compartmentalized management approach for one that recognizes and accommodates the interdependency between all components and uses of the Great Lakes Basin and its resources. While this notion has been accepted conceptually, application has been a gradual and somewhat painstaking process. Established units of government often resist initiatives that may compromise their autonomy or authority to manage the resource base in their accustomed manner. Canada-United States relations must contend with this.

Finally, institutional complexity typically increases as the institutional framework adapts to "new" knowledge. Increased scientific understanding of the Great Lakes system, changing social issues and preferences, and a changing political climate all generate "new" knowledge that must be assimilated by a management institution. In such cases, the institutional framework will adapt in one of three ways:

internal re-ordering and/or expansion of management processes within existing institutions; formation of inter-institutional linkages to address implications of "new knowledge"; or creation of new institutions to address unmet management needs. In each case, increased institutional complexity is the observed outcome. Given that the Great Lakes system is a vast "freshwater frontier" and its experiments in bilateral relations constitute a "political frontier", the continuing trend toward institutional complexity in Canada-United States relations is not surprising.

Governments also possess some inherent tendencies when operating in a multi-jurisdictional resource management setting. The political science literature, specifically that relating to organizational theory, provides a series of explanations for the evolving structure, function and authority associated with binational resource management efforts. Most obvious is the fact that the United States and Canada maintain distinct governmental structures, political philosophies and perspectives on the bilateral management of the Great Lakes. Bureaucracies of any kind must also contend with tendencies toward institutional inertia; "crisis response" management; political pressures for creating new institutional mechanisms rather than refining existing ones; the stature of regional and binational institutions as rather "weak" bodies constrained by the prevailing political will of member jurisdictions; and the experimental nature of regional and binational resource management.

The Unifying Force: Regional, Multi-jurisdictional Institutions

Federal, state and provincial agencies have always had important water resource policy and management functions in the Great Lakes Basin, and almost exclusive responsibility for standard setting and regulation/enforcement activities. However, there is a second layer of governance, comprised of regionally oriented institutions. In the broadest of terms, they serve to transcend the parochialism of the "traditional" political boundaries and focus instead on hydrologic boundaries.

Among the regional institutions, the International Joint Commission and Great Lakes Fishery Commission are the principal ones operating at the binational level, where the use of treaties, conventions, and agreements between the United States and Canada comprise the more formal mechanisms for cooperative approaches to shared problems. The former, created via the International Boundary Waters Treaty of 1909, has monitoring, surveillance, and quasi-judicial functions relating to water quality and quantity issues arising along the common frontier of the two countries. The latter, created by convention in 1954, directs its efforts at maximizing the sustained productivity of the Great Lakes fishery through control of the sea lamprey and the conduct and coordination of fisheries research.

At the U.S. domestic regional level, principal public institutions include the Great Lakes Commission and the Council of Great Lakes Governors. The Commission, created by joint legislative action of the eight Great Lakes states, was established in 1955 to promote the informed use, development, and protection of the Great Lakes via information sharing, interstate coordination, and advocacy on a wide range of regional economic development and resource management issues. The Council was established in 1982 as a forum for discussion and action by the Great Lakes governors on pertinent regional issues. In Canada, various inter-provincial and federal-provincial agreements are in force, as well as an Interdepartmental Committee on Water with representation from multiple federal departments and agencies.

Regional organizations play a pivotal role in Great Lakes management: they provide the forum in which all the "players" at all levels of government can coordinate their shared implementing roles and focus them on common problems and opportunities. They provide a framework for nurturing new ideas and management innovations, while providing buffering capacity to temper the impact of change. As essentially voluntary arrangements among traditional jurisdictions, they have limited autonomy and power, thereby posing little threat to their membership. Yet, by coordinating actions and promoting consistency among these members, they do facilitate subtle yet substantive change in resource management and environmental protection practices.

While the various regional, multi-jurisdictional institutions involved in Great Lakes policy share many goals and common interests, distinct priorities, constituents and methods reflect the nature of their respective mandates. There are, however, several common characteristics that all such entities exhibit. Such institutions are responses to the multi-jurisdictional, multiple-use resource management requirements of the Great Lakes Basin: in essence, an acknowledgement that management by hydrologic rather than political boundary is a fundamental tenet of sound water policy. They are also "creatures" of their signatory parties, being fully accountable to them and, necessarily, highly flexible and adaptable to emerging needs and the changing political climate in member jurisdictions. "Soft management" is a term that best describes such institutions, which generally lack regulatory and enforcement capability, focusing instead on coordination, policy development and advocacy. One primary value is found in their ability to promote the "strength in numbers" concept: providing a unified regional front for advocating policies to federal governments and legislatures.

Specific Initiatives for Improving and Protecting Great Lakes Basin Resources

At any given time, a multitude of specific policy, planning, research and management initiatives are underway for improving and protecting the resources of the Great Lakes Basin; many offer "lessons learned" for application elsewhere. Presented below, at the subcommittee's request, are perspectives on selected programs, funding mechanisms, regulations and information networks.

1) Great Lakes Programs

Despite the elaborate legal and institutional infrastructure in the Great Lakes Basin, there is, in fact, no single "program" within which all policy, planning, research and management initiatives are pursued. Rather, the collective programmatic approach is more appropriately described as a "patchwork quilt", held together by common threads of shared philosophy, and assembled over time by myriad agencies and organizations both within and outside government.

The design and effective operation of regional, multi-jurisdictional institutional arrangements is critical to the viability of this "patchwork guilt" and, as such, offers an important lesson for the development of basin programs in other regions.

The presence of four principal, publicly-funded institutions (i.e., Great Lakes Commission, International Joint Commission, Great Lakes Fishery Commission, Council of Great Lakes Governors) how historically been an important factor in enhancing the efficiency and effectiveness of myriad programs through coordination, information exchange and advocacy services. In recent years, for example, the Great Lakes Commission has established an

Observer program providing direct (non-voting) participation in all Commission activities for U.S. and Canadian federal agencies. provinces, regional organizations. tribal authorities and other publicly funded regional groups. Any developing program in another region is well advised to either establish (or make full use of existing) institutions that provide a forum for intergovernmental coordination and basin-oriented program administration.

The U.S. Canada Great Lakes Water Quality Agreement of 1972 (amended in 1978 and 1987) is recognized as a principal unifying force "to restore and maintain the chemical, physical and biological integrity of the water of the Great Lakes Basin Ecosystem." The Great Lakes Regional Office of the International Joint Commission, and its associated boards and council, provide a forum for scientific inquiry, policy deliberation and provision of advice to the two federal governments. The Agreement does serve as a model for potential application in a U.S.-Mexico or other binational setting. There are certain aspects of the Agreement that are perceived as weaknesses, however, and should be acknowledged. For example, the Great Lakes Commission is concerned with the lack of accountability in implementation of the Agreement. The U.S. General Accounting Office has documented inadequate communication between and among state and federal agencies regarding necessary remedial actions. Further, many IJC recommendations to the federal governments are not responded to in a timely or substantive manner. Also, clarification of federal and state responsibilities under the Agreement has historically been needed.

Within individual levels of government, various institutional arrangements have emerged over time to enhance efficiency and effectiveness through communication and coordination. Just as the Great Lakes Commission has accomplished this at the inter-state level, its individual members are exploring innovative means for intra-state coordination on Great Lakes-specific issues. For example, Michigan's Office of the Great Lakes and Ohio's Lake Erie Commission provide a focus and point of first contact on Basin issues affecting their state. Many other states have designated individuals to serve that function; they often serve as their state's official representative on regional boards and commissions. This arrangement has served the Great Lakes states and Basin well and should be emulated in other basins with developing programs.

At the federal level, many agencies have established Great Lakes coordination offices, created coordinator positions, or otherwise maintained a strong presence in the Basin via laboratories or district offices. As with the states, most federal agencies now have a point of primary contact for all Great Lakes matters.

The Great Lakes National Program Office (GLNPO) of the U.S. EPA serves as a centerpiece of the U.S. federal government's commitment to the Great Lakes. The Office was created in 1978 to oversee U.S. fulfillment of its obligations under the U.S.-Canada Great Lakes Water Quality Agreement. In 1987 the Clean Water Act formally recognized the Great Lakes as a valuable national resource and established a statutory mandate for GLNPO to lead U.S. implementation of the Great Lakes Water Quality Agreement.

To fulfill this mandate, GLNPO carries out a wide range of monitoring and research activities. The monitoring work has included water sampling throughout the five lakes, mass-balance

studies in Great Bay, Wisconsin, and analysis of all sources of lake pollution, among others. The Office researches and evaluates technologies to clean up contaminated sediments. It also creates computer models of the relationships among pollution sources. Moreover, GLNPO staff work with Canadian officials to develop binational Remedial Action Plans and Lakewide Management Plans, and report on progress in meeting these and other mandates of the Agreement.

The member states of the Great Lakes Commission fully support the Great Lakes National Program Office's role under the Agreement and view the Office as an appropriate institutional framework to address the unique requirements of the Great Lakes region. It is a model center for coordinating EPA's Great Lakes presence and, due to its focus, is ideally suited to undertake and coordinate demonstration projects of both regional and national significance. The Great Lakes National Program Office also serves as the critical link with the Canadian government in efforts to develop and implement binational Remedial Action Plans. This is an essential role that cannot be adequately filled by the governments of the Great Lake states alone.

The Great Lakes states, through the Great Lakes Commission, have long advocated the funding and programs necessary to ensure that GLNPO is in a position to strengthen levels of coordination with the Great Lakes states in all areas under the Great Lakes Water Quality Agreement; clarify the role of the EPA in the Remedial Action Plan and Lakewide Management Plan processes; provide the states with additional support and guidance in the development and implementation of Remedial Action Plans; and serve effectively as the principle coordinating device for the overall U.S. federal presence in Great Lakes management. Enhancing the stature and functions of a GLNPO-established U.S. Policy Committee, comprised of state and federal officials in the Great Lakes Basin, is another means to address these needs.

In any Basin setting, it is important to have one or more designated lead federal agencies with broad coordination, program development and implementation responsibilities. Such an arrangement typically works best in a "collegial" or partnership setting, rather than a "top down", hierarchial approach. With these thoughts in mind, the GLNPO/U.S. Policy Committee model may have some applicability to other basin settings.

As a final observation on the collective Great Lakes "program," one new initiative warrants special consideration, as it entails the development of an "Ecosystem Charter for the Great Lakes St. Lawrence Basin." This effort, coordinated by the Great Lakes Commission with support from the Joyce Foundation, entails the development, adoption and Basin-wide implementation of a policy statement—or charter—comprised of a vision statement, goals, objectives, principles and action items that are supported and pursued collectively by the array of public agencies and non-governmental entities that comprise the Great Lakes St. Lawrence policy community. The charter addresses a well documented unmet need for a single, clearly articulated statement that explicitly defines goals for ecosystem management in the Great Lakes Basin and ties a common thread through the many policies, programs, agreements, and institutional mandates that embrace the ecosystem approach concept. A large multi-jurisdictional and multi-disciplinary drafting committee plans to complete its task later this year. When completed, the charter can serve as a Basin-wide work plan, a vehicle for

coordination, and an advocacy tool to promote the informed use, management and protection of this great resource.

The ecosystem charter initiative reflects a growing trend for the use of partnership agreements and other interorganizational policy statements that provide a context for (and "umbrella" under which) multiple programs within a given basin can be pursued. Such a document might be considered as a basis for (and precursor to) any institutional design efforts in any basin with a developing program.

Funding Mechanisms

Just as the institutional infrastructure for Great Lakes Basin management is aptly described as a "patchwork quilt," there is no single mechanism or well-defined approach to funding the array of efforts that comprise the collective "Great Lakes program", across the various levels of government. Three points of particular interest to the Great Lakes Commission include the perpetually under-funded nature of federally mandated programs in the Great Lakes Basin; the growing need for creative funding approaches at the Basin level; and the need to forge inter-regional alliances at the national level to promote adoption of new multi-jurisdictional initiatives in other Basins without compromising programs and federal funds presently directed at the Great Lakes Basin.

Great Lakes environmental protection efforts are in the midst of a challenge on three fronts: The insidious threat of toxic contamination; increasing demands on state governments to safeguard past accomplishments while attending to emerging problems and ever-increasing federal requirements; and a non-so-new, "new federalism" philosophy which places the management and restoration of the Lakes increasingly in the hands of state and local governments with an accompanying decline in federal support.

Federally funded research cannot be turned on and off like tap water; consistent and adequate long term funding is critical. For more than a decade, the bipartisan support of the Great Lakes Congressional Delegation has repeatedly countered Administration budget requests that would have a devastating impact on federal Great Lakes programs. We at the Great Lakes Commission applaud that support and urge its continuation. Fighting for sheer budgetary survival takes time away from the critical issues at hand. Federal funding for Great Lakes programs is an integral component of a broader effort to protect the health and welfare of Basin residents while providing for environmental protection, economic stability and quality of life. We in the Great Lakes believe that our partnership approach to Basin management is reflected in our current funding arrangements. Through a variety of creative arrangements (e.g., Great Lakes Protection Fund, state environmental funds, local project cost share, license plate sales), states and localities are contributing substantially to efforts that were historically exclusively or predominantly federally funded. Such an arrangement should be pursued in any basin with a developing program.

As a final point on this topic, it is imperative that the growing trend toward formal basin-oriented programs not fall victim to a "zero sum" financial game. We in the Great Lakes have often described our efforts as a national model for scientific inquiry and institutional innovation. Typically, we have been most eager to accommodate inquires from other basins

and share our successes and failures. At the same time, however, we recognize that the trend may temper our own ability to maintain and enhance our own stature at the federal and Congressional levels. In this era of fiscal austerity, there is a tendency to "circle the wagons," protect all "trade secrets," and prepare to do inter-regional battle on the legislative, appropriations and program fronts to protect our own interests.

Cooperation, not competition, should be the byword. Through Clean Water Act reauthorization and other legislative vehicles, the Congress should endorse and encourage basin-oriented management and associated intergovernmental institutional arrangements. In so doing, however, funding mechanisms and levels need to be enhanced accordingly to avoid erosion of support for established, successful programs. Just as interstate cooperation has blossomed to transcend the artificiality political boundaries, inter-regional cooperation must blossom to transcend basin boundaries that can, on occasion, be artificial as well. There are many environmental issues (e.g., exotic species, airborne toxics) and economic issues (e.g., transportation policy) where basin boundaries are as irrelevant as political boundaries. Fostering linkages with emerging basin programs is, in the long run, in the best interest of all concerned.

Regulations

One of the greatest challenges confronting jurisdictions in the Great Lakes Basin is the continuing need to achieve some degree of consistency in the development and application of guidelines, standards and regulations for resource use and environmental protection among the states and provinces. The Great Lakes Charter of 1985 sought to accomplish this in the area of water quantity management. The Great Lakes Toxic Substances Control Agreement of 1986 sought to do the same in the water quality arena. A recently drafted protocol on fish consumption attempts to standardize contaminant testing and advisory activities in the various state and provincial jurisdictions. And, of course, the Great Lakes Water Quality Agreement is dedicated to this goal of consistency at a level that affects federal, state and provincial governments.

While all of these efforts have value as case studies, recent experiences with the Great Lakes Water Quality Initiative are of special interest. In the Great Lakes Critical Programs Act of 1990, the U.S. EPA was directed by Congress to prepare and publish Great Lakes water quality guidance. The Initiative establishes minimum water quality criteria, antidegradation policies and implementation procedures. In so doing, it addresses two shortcomings: the fact that existing programs do not adequately respond to the adverse effects of persistent toxic chemicals and the fact that consistency problems among Great Lakes jurisdictions do exist relative to water quality programs.

States and tribal authorities will be required to implement Initiative provisions within two years of their promulgation, or U.S. EPA will assume responsibility. As conceived, the Initiative is intended to conform with the Great Lakes Water Quality Agreement and be no less restrictive than current national policy and U.S. EPA guidance.

The Initiative is a laudable effort, pursued in the spirit of federal/state partnership and, if fully implemented, is likely to lead to reduced inputs of persistent toxic chemicals. Further, it will

move the federal government and states toward the goal of virtual elimination as provided for in the Great Lakes Water Quality Agreement. It is appropriately viewed as a vital first step; other efforts will be needed to fully achieve that goal, and to better address concerns such as nonpoint source pollution, pollution prevention, and point source discharges of persistent toxic substances.

The Great Lakes Commission has not conducted and in-depth analysis of the guidance or its projected environmental and economic impacts, and has no formal position on these matters. However, the Commission does recognize the need for the Initiative, and other efforts like it, in the interest of promoting consistency among jurisdictions within a given basin. Thus, we believe that the Initiative concept and methodology does warrant careful consideration as a template for application in other basins with developing programs.

In pursuing such application, however, it is essential that the process be an inclusive one and fully recognize and accommodate any extant agreements among basin jurisdictions, both at the domestic and binational level. A lesson to be learned in this regard is found in the 1993 report of the International Joint Commission's Science Advisory Board. The Board, while applauding the Initiative as a "positive step," noted some variance between Initiative criteria and Great Lakes Water Quality Agreement objectives. The Board recommended that "The Commission urge the Parties to strengthen and formalize their binational approach in water quality objective-setting to ensure that the Great Lakes Water Quality Initiative and related future U.S. and Canadian initiatives are pursued in a binational forum consistent with Great Lakes Water Agreement goals."

4) Information Networks

With regard to information networks, the Great Lakes Commission--and the Great Lakes community in general--do have something to offer other basins with developing programs. The Great Lakes Information Network (GLIN), an Ameritech Foundation supported initiative, is a computerized information exchange network established in 1992. The goal is to use new technology and information exchange methods to link geographically diverse agencies, organizations and individuals in the interest of promoting public policy decisions and actions that ensure the informed use, management and protection of the Great Lakes. GLIN is accessible through the Internet, the worldwide research network. Specific objectives of the two-year start-up phase include:

1. to continually identify and share, on a regional basis, information and data such as economic and environmental research inventories, meeting announcements, policy statements, legislative developments and related items;

2. to facilitate awareness, joint planning and joint implementation of programs and other initiatives between and among public and private sector interests throughout the region;

3. to provide a wide-ranging electronic forum for regional information exchange;

4. to promote use of a consistent, user friendly interface to the information resources of Great Lakes organizations;

5. to locate, access, and utilize information resources on the Internet; and

6. to use all the above for collaboration by special working groups on critical issues.

Subject areas presently available on GLIN include environment and natural resources; commerce, industry and economy; policy and legislation; human health; and education. Types of information include fact sheets; calendars and current events; databases; newsletters; directories and bibliographies; draft documents for review; and others. Bulletin board services are also available for conferencing purposes. A regional advisory board oversees GLIN, which is run as a cooperative; users are asked to input and regularly update their own data while accessing other data.

Even in this early state of GLIN development, inquiries are running at over 5,000 per month; many originate from outside the Great Lakes Basin.

GLIN is an outstanding example of a regional application of the Administration's "information superhighway" initiative. Other basins with developing programs are well advised to establish such a network as an integral component of their communications, research, policy and management operations. GLIN, in fact, has and will be used to enhance inter-as well as intra-basin communication. The Great Lakes Commission welcomes any opportunity to work with other basin officials toward this end.

Guidelines for Developing Basin Management Programs and Associated Institutions

Many decades of experimentation with multi-jurisdictional institutional arrangements in the Great Lakes Basin have yielded a wealth of information for application elsewhere. The author of this testimony has examined, methodically and in detail, the origin, development, operation and performance of a multitude of basin institutions in North America from the substate to international level. One such study, prepared for the International Joint Commission under the auspices of its Reference Study on Fluctuating Water Levels, examined numerous binational arrangements, both U.S.-Canada and U.S.-Mexico. That examination yielded a series of procedural guidelines relevant to the interests of this subcommittee. With regard to the development of binational agreements and associated basin programs, the examination found that:

1) The process of selecting an agreement is best undertaken within an open but orderly framework that recognizes and involves the range of political jurisdictions and public and private sector interests. Although the difficulties in generating consensus are directly proportional to the number of stakeholder groups involved, successful implementation will rely upon the broad base of support these groups ultimately provide.

2) A sense of "ownership" must be cultivated among agreement signatories and all stakeholder groups. Multi-jurisdictional agreements--even at the binational level--can be relegated to a "low priority" status unless a vested interest in their aggressive implementation is established. Political momentum and support can fade soon after signing ceremonies and, in some cases, even after intentions to enter into an agreement are stated.

The agreement process must therefore provide a rationale for the various agencies, jurisdictions, and other interests, to not only participate, but take ownership of that process. To do so, the agreement can be designed to reinforce and assist the efforts of individual jurisdictions and agencies as well as further cooperation among them collectively. Furthermore, agreement language can "force" the ownership issue by explicitly stating and assigning obligations to the various parties to the agreement.

3) Where possible, an established and well-defined institutional arrangement should be used as a framework for the development and implementation of a binational agreement. In most binational settings in North America, the "institutional ecosystem" is well developed, complex, dynamic, and highly sensitive (and resistant) to influences that might upset the political balance. The success of a binational agreement is enhanced if the process operates within the existing "institutional ecosystem," gaining its acceptance, support and commitment to implementation. The bureaucratic inertia to be overcome in forging a binational agreement is typically less pronounced under this scenario than when an entirely new institutional framework must be developed. In some instances, new institutions and procedures will be required to address the failings of the existing institutional framework. However, the institution-building process can take place in a non-threatening manner to ensure the support of (or at least avoid active opposition from) existing institutions.

4) Some modicum of consistency between signatory (and, in fact, all implementing) parties to a binational agreement is desirable in terms of functions, stature, organizational resources, political power and technical capability. The agreement process is enhanced when the "players" are drawn from the highest policy levels of the relevant jurisdictions and can establish comparable institutional frameworks to implement agreement provisions. The binational policy process is unduly compromised, for example, if one signatory enjoys a high degree of policymaking authority while the other must secure approval for its own decisions and implementation plans through multiple levels of governance.

5) Binational agreements should be viewed as important, but only initial steps in problem resolution. They have dynamic properties; shortcomings will inevitably be experienced and mechanisms to address them should be established. Signatories seldom, if ever, find that agreement provisions fully address every preference. Any insistence to that end can interminably hold an agreement hostage. Experience has shown that the timely signing of a compromise agreement is preferred to the lengthy delays and political confrontations involved if one or more parties holds out to incorporate contentious provisions.

In structuring and implementing a binational agreement of any kind, one of the principal challenges is that of securing a sustained commitment to policies and actions agreed upon by applicable jurisdictions. A series of seven observations follow, all drawn from case study analyses of past U.S.-Canada and U.S.-Mexico experiences. While many are intuitive, history has demonstrated that careful attention to them can notably enhance the likelihood of success in program design and implementation.

1) Formal agreements that enjoy a high profile, substantial level of detail and an implementation mechanism are less subject to the ebb and flow of public and political interest than ad hoc and other less formal arrangements. The regional landscape--in the Great Lakes and elsewhere--has been dotted throughout history with scores of interjurisdictional agreements on a great array of issues. The overwhelming majority have consisted of ad hoc and "lower level" arrangements

(e.g., memoranda of understanding, joint policy statements. cooperative projects). The "higher level" arrangements (e.g., agreements. conventions. treaties) are only infrequently used, but enjoy, in comparative terms, a substantial longevity and high stature as a focal point for multi-jurisdictional discussion and action.

2) To ensure continuing progress in agreement implementation, a system of accountability must be established and exercised. To the extent possible, agreement goals must be quantifiable, responsible parties identified, and evaluation criteria specified. Furthermore, a review and amendment procedure and timelines should be clearly stated in agreement provisions.

Specification of review procedures and a system of accountability publicly establishes expectations and performance levels. While a natural aversion to such specificity might exist within the relevant jurisdictions, it is nonetheless a desirable feature in the structure and operation of a binational agreement.

3) A flexible agreement that accommodates evolving issues and fosters creativity in binational problem solving is much preferred over a narrowly focused agreement. Resource management issues at the binational level are dynamic; constantly changing on the basis of social, economic, environmental and political developments. A binational agreement that not only tolerates such change but creatively adapts to it is far more effective over the long term than the narrowly focused agreement.

4) Accessibility is a key feature in binational agreements. Activities in support of an agreement tend to be more effective and widely accepted if all public and private sector interests can access implementing agencies and participate in implementation efforts.

5) Success in implementing a binational agreement is enhanced if provisions are institutionalized by being incorporated into applicable federal, state, provincial and local programs and legislation. The signing of a binational agreement is significant, but not an end in itself. Rather, it formalizes a commitment that must be carried out long after the political impetus and public profile associated with the agreement has waned. In essence, statements of binational policy must become statements of federal, state, provincial and local policy.

6) Incorporating dispute resolution procedures into agreement provisions can be an effective means to address differences among affected parties and avoid tendencies to circumvent the agreement altogether. In addition to formalizing mutual understandings of policy or presenting the terms of a dispute settlement, binational agreements of any form are typically established to enhance coordination and provide a forum for discussion among the various jurisdictions. They are, in the simplest of terms, mechanisms to be used to the benefit of the jurisdictions, not obstacles that must be overcome.

7) Even the strongest agreement can fall victim to apathy; political support must be cultivated to ensure the future viability of the agreement. Political support can be guaranteed through agreement language, legislation, planning documents or any form of the written word. Rather, it must be cultivated and nurtured over the long term. Within agreement language and implementation activity, however, measure can be taken to provide an environment conducive to political support. Participants in the agreement process should be secured, where possible, from positions of authority in all affected jurisdictions. A "win-win" scenario must be

presented; the benefits of participation accruing to the individual jurisdictions should meet or exceed the benefits accruing to the common good.

Regional multi-jurisdictional agreements and institutions for water resource management have historically existed somewhat uncomfortably in the political landscape. To some, they clutter the governance system by obscuring political boundaries with hydrological ones. Further, they tend to be creatures of their signatory parties and therefore highly dependent upon them. Effectiveness of an agreement is therefore largely determined by the implementing institution's ability to maintain the political support of its own members and that of other agencies and jurisdictions it must interact with.

In establishing a Basin institution to implement any such agreement, another helpful tool is a checklist of institutional parameters--both structural and operational--that can guide the institution-building process. Such a checklist is presented as an addendum to this testimony. It was developed by the author on the basis of a review and evaluation of fifteen generic forms for basin management employed in North America to date. The checklist has since been used in institutional design exercises from the local watershed to binational basin level.

Closing Statement

A return to basin-oriented resource planning and management is a growing trend in the United States, fostered by new Administration and Congressional initiatives, as well as an upswell of interest at the regional and local levels. The Great Lakes Commission recognizes and encourages this trend, noting that the Great Lakes Basin has a long and rich history of basin-oriented governance, demonstrating a level of efficiency and effectiveness rarely attained via the traditional political jurisdictional approach to resource management and environmental protection.

Each major basin in the United States is unique in terms of physical, socio-economic, environmental and political characteristics. No single model, or template, for basin institutions or programs can be applied in its entirety to any given basin. However, there are typically many lessons to be learned from other experiences that can collectively shape—or influence the shape of—a developing program. The Great Lakes Basin has much to offer in this regard.

The Administration and Congress are to be applauded for initiatives that promote the broad adoption of basin-oriented approaches on a national scale. In so doing, it is imperative that established and successful programs, such as those in place in the Great Lakes Basin, receive ongoing (and in many cases enhanced) support, while start-up efforts are underway in other basins. Active, innovative and well-funded Great Lakes programs are sound investments, as they will provide the type of model—and continue to yield valuable lessons—for application elsewhere.

Addendum

Checklist of Institutional Parameters for Basin Management

Structural Parameters

1) Definition of Mandate

a) The goals and objectives of an individual institution must be consistent with and supportive of those for the overall watershed planning and management effort.

b) Objectives should complement those of other institutions while avoiding duplication.

c) Goals and objectives, where possible, should lend themselves to evaluation to provide indications of progress over time and permit "mid-course corrections" to structure and operation.

d) The institutional mandate should be specific, yet sufficiently flexible to accommodate emerging planning, coordination and management needs.

e) The mandate should be given a degree of formality and longevity through use of local ordinance, legislation, articles of incorporation or other legally recognized means.

2) Geographic Area of Concern

a) Institutional authority should extend throughout the entire watershed, involving water and related land resources.

b) While maintaining a primary focus on the watershed, the institution should be sensitive to issues and activities in adjacent, non-watershed areas that may impact upon planning and management needs in the watershed of interest.

3) Membership

a) The institution is only as strong as its membership, and every effort must be taken to secure the direct involvement of all public and non-governmental interests in the decision making process. A mechanism should also exist to ensure a direct role for interested individuals who lack an organizational affiliation but can contribute to the institution's efforts.

b) The extensive use of committees, task forces and other groups should be pursued vigorously, as it enhances a sense of joint ownership in the institution, and can also extend otherwise limited staff resources.

c) The institution should pursue consensus-based decision making as a matter of policy, yet provide for a majority vote rule in its bylaws as an option to be employed when necessary.

4) Breadth of Authority

a) The institution should be fully accountable to its membership and responsive to its consensus decisions.

b) While ultimate accountability to members is appropriate, member agencies and organizations should vest the institution with any and all management functions that can be administered more efficiently and effectively on a watershed rather than political jurisdictional basis.

5) Financing

a) Appropriations from member organizations, along with other reliable, long-term revenue-generating mechanisms, should provide the basis for financing institutional operations. Acquisition of public/private grants, donations and contracts is an appropriate supplement, provided that the pursuit of the institution's mandate and member priorities is not compromised in the process.

b) Full participation and voting privileges should be contingent upon a given member organization meeting its full financial commitment to institutional operations.

6) Staffing Arrangements

a) Staffing should be conservative, but appropriate for mandated function.

b) Detailing of member organization staff to the institution, via inter-agency agreements or other mechanisms, should be vigorously pursued.

c) An emphasis on staff training and development should be maintained to secure and retrain quality staff with a sensitivity for member jurisdiction needs and perspectives.

7) Management Functions

The institution should either perform the following management functions or, in its coordination role, ensure that they are performed by some entity in the watershed.

a) Centralized data collection, storage and analytical capability;

b) A research or research coordination capability to address/analyze emerging issues;

c) An extension service capacity to advise, educate or otherwise inform watershed agencies, organizations and individuals of relevant issues;

d) Regulation and enforcement functions in those areas where centralized watershed-based administration is more efficient and effective than individual jurisdictional approaches. At the minimum, a role in recommending environmental quality/resource development standards for uniform adoption is appropriate.

e) A forum for dispute avoidance and, where necessary, an arbitration/conflict resolution mechanism;

f) Comprehensive watershed planning for the protection and development of the resource base;

g) A monitoring/surveillance capability, or a role in coordinating such, among relevant watershed jurisdictions;

h) Coordination of policies and programs among member organizations and other relevant public and private sector entities with shared interest in management of the resource base;

i) A public participation program designed to inform, educate and solicit input from interested parties at all stages of the planning and management process;

j) An advocacy role directed at points of political influence, as appropriate, for the purpose of enhancing progress toward stated goals and objectives for watershed management;

k) A consensus building mechanism providing for policy development on issues of concern to member organizations; and

l) A special studies function to undertake impact assessments and otherwise address emerging issues.

8) Resource Focus

a) The resource base in its entirety - all components and interactions among them - should be within the realm of institutional interest; ecosystem-based planning and management should be adopted.

b) A principal focus should be directed at issues and aspects of watershed resources that are of primary interest to all or most member organizations. Special issues lacking watershed-wide implications should not typically be pursued.

Operational Parameters

1) Role in the Institutional Ecosystem

a) Before a new or revised institution is set in place, a clear demonstration of need must be evident in light of existing institutional capabilities and watershed management goals and objectives.

b) A new or revised institution must be set in place in such a manner as to avert or otherwise minimize disruption of ongoing institutional activity.

c) Informal linkages among regional institutions should be fostered to ensure complementary and mutually supportive programs.

d) The institution must display a sensitivity to (and accommodation of) the methods, biases and constraints within which political jurisdictions approach watershed issues.

e) A sensitivity and responsiveness to the needs of public and private sector entities (beyond member organizations) should be pursued in recognition of their role in the overall watershed management effort.

2) Pursuit of Mandate

a) The institution should exercise its full range of authority in pursuing its mandate; selective attention to areas of authority should be pursued only in light of an overriding rationale, such as in the start-up phase of operations.

b) Rigidity in program design should be avoided in favor of institutional flexibility to address emerging issues.

c) An anticipatory posture should be nurtured to avoid historical "crisis response" management tendencies.

d) Areas for potential institutional activity should be assessed in light of watershed goals and objectives to ensure their relevance.

3) Membership Relations

a) Responsiveness to the needs of member organizations should be of paramount importance in both day-to-day operations and long-term planning.

b) The institution should serve as a catalyst for improved watershed management efforts, and take every opportunity to credit member organizations for successes achieved.

c) Informal, interpersonal linkages between the institution's staff and member organizations' representatives should be nurtured.

d) The institution should approach its coordinator/catalyst role subtly, to ensure that member organizations regard it as a mechanism to serve rather than lead them.

4) Stature and Credibility

a) Objectivity in agenda setting, analyses and policy development must be pursued, and a reputation in that area fostered among membership and constituents.

b) Building institutional support through promotional/public relations activities is essential to institutional stature and credibility. Approaches include developing political

linkages, utilizing the media to disseminate information, and maintaining a program open and accessible to the interested public.

c) A sensitivity to watershed-wide priorities in agenda setting, and an integrated approach to environmental and economic development aspects, should be pursued to ensure a broad support base.

d) In maintaining an open planning and management process, full disclosure of the rationale behind all decisions, particularly the unpopular and controversial ones, is advised.

e) The interest and political will of member organizations must be nurtured to maintain support for watershed planning and management efforts. Voluntary and compulsory incentive systems should be investigated and applied, as appropriate.

5) Management Philosophy

a) The ecosystemic attributes of the watershed and its resources should be acknowledged and reflected in planning and management programs.

b) Long-term planning and pursuit of watershed management goals should not be sacrificed for short-term considerations designed only to enhance the institution's stature.

c) The institution should be wary of "capture" by special interests and any tendency to compromise its objectivity in pursuit of its mandate.

d) Coordination of disparate management functions (e.g., planning and implementation) should be pursued at the intra- and inter-institutional level to ensure consistency of approach toward watershed management goals and objectives.

e) While acknowledging ultimate accountability to member organizations, the institution should exercise some degree of autonomy and discretion in the interpretation and application of stated policies.

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WATER QUALITY
COALITION

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Oral Statement Of

Dale K. Phenicie
Georgia-Pacific Corporation

On behalf of
The Great Lakes Water Quality Coalition

Before the

U.S. House of Representatives
Committee on Merchant Marine and Fisheries
Subcommittee on Oceanography, Gulf of Mexico
and the Outer Continental Shelf

March 24, 1994

Printed on recycled paper

Introduction

Mr. Chairman and Members of the Subcommittee, my name is Dale Phenicie. I am the Manager of Environmental Regulatory Affairs for Georgia-Pacific Corporation. I serve as the Environmental Policy Task Group Chairman for the Great Lakes Water Quality Coalition and am appearing on their behalf today. I also serve as Chairman of the American Forest and Paper Association's (AF&PA) Great Lakes Task Force and participate in that organization's Gulf of Mexico Task Force. I have degrees in pulp and paper technology and analytical chemistry and have worked in the environmental protection field for more than 30 years.

The Great Lakes Water Quality Coalition is an association of over 100 businesses and municipalities formed specifically to participate in the Great Lakes Water Quality Initiative or GLI development process. The Coalition is strongly committed to continuing improvement in the environmental quality of the Great Lakes. We are deeply concerned, however, that the proposed GLI will not meet that objective. I am pleased to be here today to present our views on the proposed GLI, and reflect on water quality protection program needs for the Gulf of Mexico.

The GLI - A Severely Flawed Approach

The GLI is a severely flawed proposal. Because of the approach used, it has become too extreme and would be counterproductive to the implementation of real environmental solutions for the Great Lakes. Its initial goal was to promote more consistent water quality protection throughout the Great Lakes ecosystem. In actuality, the GLI process did not recognize many environmental laws now in place and the voluntary efforts that have been at least partially responsible for the dramatic environmental improvement in the Lakes. It also ignores the more effective comprehensive alternatives for water quality enhancement, such as Lakewide Management Plans (LaMPs). The U.S. EPA's own independent science advisory board has severely criticized certain aspects of the proposal, focusing special attention on the inadequacy of the underlying research.

EPA's effort in the GLI to define things like "bio-concentrating chemicals of concern" and set water quality criteria for these substances represents the cutting edge of water management policy. The science needed for such a bold approach has not been fully developed. This reality has resulted in the application of multiple safety factors and the setting of extremely conservative "tier II" values which result in the very low criteria contained in the GLI proposal. The conservative nature of these criteria is responsible for a large part of the extremely high cost of the Initiative.

There is no question the Great Lakes ecosystem has endured a number of stresses. The pressures of human uses, habitat changes, exotic species and the presence of certain chemical substances have impacted water quality. The good news is that due to numerous state and federal laws and voluntary protection programs which have evolved during the past three decades, much progress has been made. Water quality is greatly improved. Fish and bird populations, including the bald eagle, have increased dramatically. The problems which remain are localized and specific in nature. EPA's "one size fits all" approach to the GLI will not improve water quality or accelerate the progress of the real environmental solutions.

I would like to provide for the Subcommittee a report prepared by Dr. Paul Rogers, a noted Great Lakes researcher. Dr. Rogers has contacted 19 regional experts and conducted a literature search which produced 1000 references. This effort has provided a picture of ecosystem conditions which is much better than that which is often painted. In short, the Lakes are in good condition; it's the "trouble spots" which much be addressed. This study gives credence to the concept of dealing with the site specific problems and not writing a broad single prescription for the entire basin.

Costs Underestimated - Benefits Overstated

EPA has grossly underestimated the cost of this proposal. They conclude that many municipalities will not have to spend money to meet the new limits because they will simply require their users to remove the controlled substances from the waste stream sent to the wastewater treatment plant. They have not estimated the cost to municipal sewer system users to meet the new pretreatment standards. Although the proposal does not grant "intake credits" to account for the concentrations of regulated chemicals which enter the plant with intake water, EPA did not estimate the costs for treatment when intake concentrations exceed discharge limits. The plant will have to remove the material even if it did not put it into the discharge stream.

If this 250-page rule is adopted, every wastewater treatment facility within the region may be required to install extremely expensive modifications. In a study conducted by DRI/McGraw Hill for the Council of Great Lakes Governors, DRI conservatively estimates the Initiative could cost industries and municipalities as much as $2.3 billion per year for system modifications and could lead to as many as 33,000 jobs lost in the region. A joint study conducted by Georgia-Pacific and the Gary, Indiana Sanitary District has determined that it will take four years of studies and document preparation, at a cost of $1.5 to $3 million, just to file a permit renewal application. The sad reality is this expenditure of time, money and effort is misdirected and will not lead to a significant improvement in Great Lakes water quality.

Most of the benefits ascribed to the proposal relate to increased utilization of fish resources or tourism and have been overstated. EPA assumes that benefits will be derived from reduced fish consumption advisories, however, the study for the Council of Great Lakes Governors questions whether any advisories will be lifted as a result of this proposal. EPA also describes tourism benefits of $1.3 to $1.8 million due to increases in bald eagle, osprey, otter and mink at a "wildlife sanctuary" in Green Bay, Wisconsin. EPA apparently never visited this site, located within one-mile of downtown Green Bay, which consists of a picnic area, exhibit building and landing area for migrating birds -- hardly an environment for eagles, osprey, mink and otters.

Real Environmental Solutions Are Needed

The Lakewide Management Plan (LaMP) approach poses special promise for bringing about further improvements in the state of the Lakes, in a sound, cost-effective manner. LaMPs provide an opportunity to conduct an accurate assessment of existing conditions and design programs aimed at site specific needs.

Unfortunately, rather than take the opportunity to use available information and perform new studies to determine current water quality and ecosystem conditions, EPA in pursuit of the GLI program has focused on the development of water quality criteria for chemical substances. Adequate consideration was not given to whether achieving these criteria on a lakewide or basinwide basis will change conditions in the remaining "trouble spots."

The proposed guidance would also put in place a complicated set of permitting procedures that add to the administrative burdens reflected in the Gary study and stifle economic development by changing the focus of the antidegradation policy. The revised policy would no longer involve the evaluation of site specific water quality changes but require the prohibition of even minuscule increases in discharges of listed chemicals. This prohibition would be put into place even if the existing permit limits allowed the higher discharge quantity and no change in local water quality occurred.

In short, the GLI proposal has become incorrectly focused as an effort to change the manner in which chemical criteria are established rather than an evaluation of our progress and determination of the steps which should be taken to address the remaining problems.

What Should we do in the Gulf?

Although it does not contain all that we would desire, the existing Gulf of Mexico Program has been set forward in the right direction.

It is a science-based program consisting primarily of data gathering and an environmental assessment. Acting Director Doug Lipka has done a good job of focusing on the science. Only after completion of a thorough assessment with input from industry and non-governmental sources should any recommendations be considered.

The program structure should be expanded to include experts in risk assessment and economic analysis to ensure that priorities are properly set and the cost/benefits correctly estimated. International factors must be considered to ensure that any U.S. efforts will truly make a difference. A data/technical review panel would help ensure that the focus of the Program stays on "good science." Any management plan must provide for environmental assessments so that any recommendations reflect the needs identified by the assessment.

Conclusion

The Coalition appreciates the opportunity to present our views to the Subcommittee. Please let us know what additional information you would like us to provide. The American Forest and Paper Association plans to submit written comments and has asked me to request that the record remain open for a few days for that purpose. Thank you for your attention. I would be happy to answer any questions.

TESTIMONY

BY

TIMOTHY SCRUGGS
MANAGER
WHITING REFINERY
AMOCO OIL COMPANY

BEFORE THE

HOUSE COMMITTEE ON MERCHANT MARINE AND FISHERIES
SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF

ON

REGIONAL WATER PROGRAMS

MARCH 24, 1994
WASHINGTON, DC

Testimony on Great Lakes Initiative

Timothy Scruggs

Thank you, Mr. Chairman. I am Timothy Scruggs, manager of Amoco's Whiting, Indiana refinery, the largest inland refinery in the United States located on the southern shore of Lake Michigan.

Amoco has been a part of the Whiting community for more than 100 years and presently employs over 1600 people, most of whom live within the Lake Michigan watershed. Amoco and its more than 14,000 employees residing throughout this region appreciate the Great Lakes as a natural resource. We are dependent on the lake's water and committed to its preservation and improvement.

Our refinery studies have indicated that Amoco's capital outlay to comply with the GLI as written, will be in excess of 200 million dollars. For this reason, I appreciate the opportunity to appear before this subcommittee and share our views concerning the Great Lakes Initiative.

Amoco is interested in ensuring fair and workable GLI provisions that will further protect and preserve the Great Lakes. We also believe that a robust economy and strong employment base is vital to the future of this region. Therefore, we strongly support the position that only through sound science and risk-based controls can we create successful environmental policies and achieve the objectives of both environmental and economic health in the Great Lakes basin.

The GLI was mandated under the Critical Programs Act of 1990. Unfortunately, the proposal is based upon command and control principles and does not allow the flexibility to account for local and site-specific conditions. Amoco has supported a comprehensive region-wide approach that addresses all sources of pollutants of concern and determines which emissions pose the greatest harm to human health and the environment. Unfortunately, most of the recommendations promoted by Amoco and representatives from industry and the municipalities have not been adopted in the proposal.

As a matter of course, Amoco believes that all environmental protection policies should be based on accurate science. Such policies should set achievable goals, be flexible in order to recognize local conditions and allow for the use of cost-effective alternatives. And finally, all implemented policies should result in some measurable

environmental improvement for the capital spent. Our analysis of the GLI proposal indicates that it does not meet these fundamental tests.

The GLI will not result in any measurable environmental benefit. Because of its narrow focus on point sources, it will not achieve significant reductions in pollutants of concern nor will it result in the lifting of any fish consumption advisories - the traditional indicator of Great Lakes impairment. As concluded by the DRI/McGraw Hill Study commissioned by the Council of Great Lakes Governors, the GLI will not significantly improve the water quality of the Great Lakes, while imposing compliance costs up to $2.3 billion on Great Lakes industries and municipalities.

One of the GLI's biggest problems is that its underlying premise is flawed: it is not an ecosystem approach to regulating toxic pollutants, even though EPA describes it as such.

A true ecosystem approach would consider all sources and fates of pollutants within the Great Lakes basin. The GLI, however, only addresses industrial and municipal point sources, which account for a very small percentage of the toxic loadings to the Great Lakes. Non-point sources such as air deposition, urban and agricultural run-off, and contaminated sediments are ignored. Studies have shown that these non-point

sources contribute over 90 percent of the toxic loadings to the Great Lakes. This omission will result in significant water quality problems remaining even after the GLI is implemented. And by that time, valuable time and resources for addressing the most critical problems will have been spent.

Two provisions with which the Whiting Refinery specifically has concerns are arbitrary restrictions on mixing zones for non-bioaccumulative chemicals (also known as non-BCCs) and intake credits.

A mixing zone is an area in the vicinity of a facility's outfall where a discharge undergoes mixing with the receiving water. Currently, all water quality standards must be met at the edge of the mixing zone. Current EPA guidance recognizes that mixing zones can maintain the overall biological integrity of a waterbody and eliminate unnecessary end-of-pipe controls. The GLI, however, proposes to arbitrarily restrict the size of a mixing zone for non-BCCs. This will require Whiting to install over $50 million in additional treatment, even though such additional controls may be unwarranted and scientifically unjustified to protect aquatic life and the environment.

Most major facilities use large amounts of water for cooling - water which does not come into contact with the production process, is circulated once and then discharged.

This once-through non-contact cooling water is not a source of toxic pollutants to the Great Lakes. Rather, in most instances, the origin of a pollutant in non-contact cooling water comes from the waterbody from which the facility obtains the water.

Yet, the proposed GLI could require removal of pollutants found in intake waters because it does not provide for an "intake credit" for pre-existing pollutants. It is extremely difficult, and in some cases impossible, to remove pollutants already present in the large volumes of intake water used for cooling. Further, a discharger would be essentially treating the water to levels cleaner than intake quality. The GLI should not require such treatment and should instead allow for intake credits.

In the absensce of intake credits, the Whiting Refinery would have to install cooling towers and entirely eliminate the discharge of 120 million gallons per day of non-contact cooling water. This would cost over $140 million. It would also create another set of problems - increased energy consumption and solid waste disposal.

Clearly, the GLI in its present form is not the solution for the Great Lakes region's environmental problems. But what can be done about it and yet still maintain the environmental health and economic vitality of the region?

One, we strongly urge EPA to first evaluate the contribution of all pollutant sources to the Great Lakes, and prioritize control measures based on their environmental benefits and cost effectiveness. Only by first completing this multi-media or ecosystem assessment and implementing corresponding controls will the GLI result in measurable environmental improvement.

Two, the GLI's mixing zone policy should be based on sound science and recognize site-specific conditions, as presently allowed in current EPA guidance.

And three, EPA should allow credits for pollutants present in intake water.

Industry, government, and the taxpayers of the region cannot afford to have the regulatory system operate as it has in the past. As we demonstrated with the Amoco/EPA Yorktown Pollution Prevention Project, creative and innovative programs to address environmental issues must replace the traditional command-and-control, end-of-pipe, and single-media approaches. Just as the resources of the environment are not infinite, neither are the economic resources of industry and municipalities. We must be prudent in our expenditures and demand that we get real environmental benefits as a result of our expenditures.

We believe that industry and government rationally working together towards these goals, both environmentally and economically, can bring about drastic improvments. For only by balancing environmental and economic interests on the basis of sound science and economic reality will the goals of the GLI, the Gulf of Mexico or any other regulatory initiative become truly attainable.

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CLEANING UP THE GREAT WATERS

STATEMENT OF GEORGE COLING

SIERRA CLUB GREAT LAKES SPECIALIST

MARCH 24, 1994

ON THE NEED FOR GREAT LAKES WATER QUALITY GUIDANCE

AND THE APPLICABILITY OF GREAT LAKES FEDERAL ENVIRONMENTAL PROGRAM MODELS

TO THE GULF OF MEXICO AND OTHER GREAT WATERS

BEFORE THE SUBCOMMITTEES ON OCEANOGRAPHY, GULF OF MEXICO, AND OTHER

CONTINENTAL SHELF AND ON ENVIRONMENT AND NATURAL RESOURCES

COMMITTEE ON MERCHANT MARINE AND FISHERIES

U.S. HOUSE OF REPRESENTATIVES

At the outset, I would like to thank the two Subcommittees and their respective Chairmen for holding this hearing. Exploring the institutional arrangements for delivering clean water to our nation's people and troubled ecosystems is an example of Congressional leadership needed to cope with problems facing the American people daily. Thank you for inviting me to participate in this process.

My name is George Coling, and I am the Sierra Club's Great Lakes Specialist, based in Washington. Our Great Lakes staff is headquartered in Madison, Wisconsin, and our Great Lakes volunteer activists are organized in Ontario, the eight Great Lakes States and many Great Lakes communities, from the pristine shores of Lake Superior to urban centers like Buffalo, Detroit and Chicago. We have worked to protect the Great Lakes for over twenty years.

THE GREAT LAKES ENVIRONMENTAL INFRASTRUCTURE

Sierra Club and many other environmental organizations worked for the 1987 amendments to the Clean Water Act, Section 118 of which establishes the EPA's Great Lakes National Office. We have worked each year since then to secure adequate funding for EPA's GLNPO and other federal programs in the Departments of Interior and Commerce and elsewhere. Over the years Sierra Club has supported legislation such as the current H.R.2566, the Great Lakes Federal Effectiveness Act, cosponsored by Rep. Fingerhut of Ohio and Rep. Quinn of New York and others which further coordinates the work of Great Lakes agencies. We strongly support the International Joint Commission which recommends to the Canadian and U.S. Governments needed steps to implement the Great Lakes Water Quality Agreement. Since 1989, we have happily seen the IJC grow into a role of soliciting citizen opinion as never before and voicing it to the two federal governments. Sierra Club has also worked with Canada, Ontario, with every state environmental agency, and increasing with Tribes and first Nations to secure cleaner water for the Great Lakes.

We strongly support the institution of GLNPO, but we even more strongly support its role in leading United States' compliance with the Great Lakes Water Quality Agreement. Thus, we laud EPA successes such as the Assessment and Remediation of Contaminated Sediments (ARCS) program and lobby adequately for Great Lakes appropriations, but we are also critical of Canadian and U.S. Agencies such as in the 1991 report, Broken Agreement, which I would like to submit for the record.

The United States and Canada last renegotiated this visionary Great Lakes Water Quality Agreement in 1987. Sierra Club participated in the negotiation, and we are one of many organizations and Great Lakes citizens who share both the pride and responsibility for seeing the objectives of the Agreement implemented.

The most important of these objectives is to virtually eliminate persistent toxic substance in the Great Lakes environment. As Great Lakes citizens, we have no moral choice but to work for this objective. Scientific evidence continues to mount that our polluted society is tinkering with future generations' ability to enjoy health, to achieve full developmental capacity, in terms of cognitive learning and other systemic functions and to reproduce.

Those most at risk are the children of those exposed to these persistent toxic chemicals. Moreover, this health threat extends to wildlife and fish throughout the Great Lakes, threatening the health of the ecosystems, itself.

I would like to submit, for the record, several scientific studies which illustrate and popular accounts which describe the rapid growth of information on the threat from endocrine-disrupting, estrogen-mimicking and cancer-causing chemicals which enter the Great Lakes and other large ecosystems through the air, industrial discharges, runoff, leaks and spills and other way and bioaccumulate in the food chain of these ecosystems. I also refer the Subcommittees to Dr. Kenneth Olden, Director of the National Institutes of Environmental Health Sciences. NIEHS has already sponsored two ground-breaking conferences in 1994. The first, in January, NIEHS gathered the world's leading experts on estrogens in the environment. The second, in February, convened over 1000 People of Color from toxic communities with government decision-makers to determine health research needs to secure environmental justice. Six other federal agencies co-sponsored this unprecedented educational program. NIEHS will be publishing reports on both conferences in the next year or so. Since the most threatening pollutants to large ecosystems like the Great Lakes and the Gulf of Mexico are the organochlorines which interfere with endocrine systems and since environmental health damage is disproportionately borne by People of Color, the Subcommittees would do well to consult with NIEHS on the matter of environmental health in and near the Gulf of Mexico and other large bodies of water.

PROGRAM PREDICATING STRUCTURE

As I stated above, our support of the organization and structure of federal agencies in the Great Lakes is predicated on their active missions to implement the Great Lakes Water Quality Agreement, using the authorities of U.S. domestic environmental laws and seeking partnership with Canada on all matters of ecosystem health. These two goals -- using domestic laws to implement a plan for protecting ecosystem and human health and seeking international partnership -- must frame the missions of any and all federal structures to address the environmental problems of any Great Waters ecosystem. Even Great Waters which do not overlap other nations' boundaries are subject to transboundary airborne transport and deposition of persistent toxic chemicals or -- as dramatically illustrated in the Great Lakes -- invasion by "exotic" species like Zebra Mussels.

Let me focus on some of the program objectives of EPA's Great Lakes Program and suggest these objectives be featured in any federal program established to clean up the Gulf of Mexico or other bodies of water.

1. <u>Virtual elimination of persistent toxic chemicals through zero discharge of these substances.</u> The Great Lakes Water Quality Guidance is a needed <u>first step</u> in this direction. Since Rep. Ortiz and Rep. Studds have asked for specific comments on the Guidance, I have reserved a separate portion of this testimony for that purpose, below.

2. Identify, assess and remediate toxic hotspots. The Great Lakes Water Quality Agreement establishes a process to designate Areas of Concern (AOC), toxic hotspots of which there are 43. The Agreement calls for the EPA and Environment Canada to develop Remedial Action Plans (RAPs) for each AOC, usually a harbor area. Each RAP requires broad participation of stakeholders to identify sources of pollutants and then outline and implement measures to clean up the AOC. An effective RAP like approach is necessary for other ecosystem programs, but improvements are needed. RAPs must have stricter deadlines and be adequately funded. RAPs must be enforceable, and they must cooperate internationally. People of Color and low-income communities must be better involved in the remedial planning process.

3. Clean up toxic sediments. Water use in 42 of the 43 AOCs is impaired by contaminated sediments. GLNPO's program of pilot studies to decontaminate toxic harbor sediments is a success story. Known as ARCS--Assessment and Remediation of Contaminated Sediments -- and authorized by the Water Quality Act of 1987, this program has identified decontamination technologies on a small scale for five sites The (attached) Coast Alliance fact sheet on ARCS details this success.

First of all, Congress needs to reauthorize and expand ARCS in the pending Clean Water bill. Such a provision passed the Senate Environment and Public Works Committee on February 25, 1994. Rep. Fingerhut and others have co-sponsored H.R.2566, a House ARCS reauthorization bill. The Great Lakes needs your support to continue this success story. The nation also needs to expand the ARCS approach to the salt-water coast. Sierra Club submits that any regional bill involving a salt-water ecosystem contain an ARCS-like provisions. It is now time to assess and test salt-water contaminated sediments clean up technology.

A second element of toxic muck clean up is for the EPA to promulgate an ambitious, well-funded national program of sediment quality criteria for state and tribal use in determining how clean is clean after dredging. PCBs and dioxins need to be statutorily specified as priorities for criteria developments. Otherwise, toxic muck threatens to clog up our nation's ports.

These toxic sediments area clear threat to not only the Great Lakes environment, but also the Great Lakes economy. Tourism is now the second largest sector of the economy in Ohio and a significant sector in all Lakes states. Yet this economy is threatened by continued contamination. Nitrate pollution and persistent toxics levels for PCBs and dioxin are increasing in several lakes. Table I-2 shows the persistent toxic levels of PCBs in coho salmon in all the Great Lakes. These levels are over 70 times the EPA's 1/100,000 cancer risk level and may cause thousands of cancer cases each year.

In June 1993, Sierra Club released its "Clean Lakes, Clean Jobs" study that documents the jobs and money at risk if we fail to cleanup the toxic blobs that rest at the bottom of every Great Lakes harbor. Billions of dollars and thousands of jobs are at risk if toxics are not cleaned up (see table).

GREAT LAKES JOBS AT RISK

	JOBS	COSTS
HEALTH	*	$18.47 Billion
FISHING	89,000	4.0 Billion
SHIPPING	44,000	3.5 Billion
TOURISM	2,760,000**	69.0 Billion
TOTAL	2,893,000	$94.97 Billion

[* complete data unavailable; ** assumes $25,000/direct job]

Great Lakes tourism is the most threatened industry. Tourism is a $69 billion industry in the Great Lakes Basin and the number two industry in several states. In Ohio, Lake Erie recreation industry accounts for $8.5 billion and 152,000 jobs.

Approximately 89,000 fishing jobs and more than $4 billion in commercial and sport fishing proceeds are in jeopardy. There are more restrictions on fish consumption in the Great Lakes than anywhere in the United States, 1,000 of the nation's 1,400 fishing restrictions -- five in seven -- come from Great Lakes states. As the EPA said, these are largely a result of sediment contamination.

Also at risk are more than 44,000 shipping jobs and $3.5 billion in personal and corporate income, including state and local taxes paid by the ports. Contamination and lack of a national program to deal with this toxic muck prevent safe dredging in half of all Great Lakes harbors where sediments cannot safely be dredged.

Because communities cannot safely dredge this toxic sediment, barges must lightload their cargos an average of 480,000 pounds. This means lost profits and jobs in the millions for the entire Great Lakes Basin.

If one extrapolates these risks to the country at large and three other coasts, the potential job risk could be near 10 million and the commerce at risk could be near $400 billion. That justifies an aggressive national program to identify and clean these sites. While the price tag for cleaning up all Great Lakes seems expensive -- $10 billion by some estimates -- the potential of creating 400,000 jobs in depressed areas of the Great Lakes is enormous.

4. Reduce airborne deposition. Science is increasingly demonstrating the harm from airborne deposition of persistent toxics into our Great Waters. DDT levels for instance, are going up in the Great Lakes. It is blowing in from Mexico and South America, surely falling also into Gulf Coast Waters, as well. The 1990 clean Air Act listed seven types of persistent toxic chemicals -- alkylated lead components, polycyclic organic matter, hexachlorobenzene, mercury, polychlorinated biphenys, 2,3,7,8 tetrachlorodibenzofurans and 2,3,7,8 tetrachlorodibenzo-p-dioxin -- and requires an expedited schedule of

regulating their sources. The Clean Air Act also required the EPA to report to Congress by November 15, 1993 the extent of and harm from these air toxics and the EPA's recommendations for action. Sadly late, this report, based on a draft which I have seen, will soon recommend several actions which could be delivered through a Gulf of Mexico or other water body regional office. Such a regional program should include monitoring fate studies, exposure studies and other research efforts on these toxics. Pollution prevention and enforcement efforts and needed international negotiations to curtail use of DDT and other persistent air toxics could and should be delivered or coordinated through a Gulf of Mexico regional office as they have been through the GLNPO in Chicago.

5. Control polluted runoff and pressure wetlands. These two objectives are incorporated to a lesser extent than the above ones in GLNPO's program. They need to be emphasized in new federal regional Great Waters offices which could deliver programs such as researching the value of wetlands or cataloguing and sharing site-specific polluted runoff plans. This need is dramatized by the Cryptospiridium incident in Milwaukee last April which left 50 people dead.

6. Deliver environmental justice. The Water Quality Act of 1987 does not incorporate environmental justice into GLNPO's program. Let me suggest here that a Gulf Coast or any other regional ecosystem office must incorporate delivery of environmental justice as a program objective. The President's Executive Order on Environmental Justice. (2/11/94) will require such a mission and a strategy for each federal agency. However, the Gulf Coast, for example, features Cancer Alley in Louisiana, severely polluted African American communities in Houston and New Orleans, large severely exposed farm worker communities in Texas, Louisiana and Florida, civil rights complaints against siting policies of Mississippi and Louisiana and lots of low income people who eat lots fish and seafood. Any federal environmental program operating in the region that does not acknowledge and plan to redress these environmental injustices will have no credibility to deal with those most at risk to disease from dirty water. A similar analysis could be made for any other region.

GREAT LAKES WATER QUALITY GUIDANCE

Sierra Club has long supported the EPA's proposed Great Lakes Guidance. We lobbied for passage of the 1990 Great Lakes Critical Program Act which required the EPA to publish the Guidance on deadline. The Club urged the Bush and Clinton Administrations to publish the draft, met with state officials to urge their support, trained volunteer leaders to comment on the draft, produced a video educational program urging Great Lakes citizens to file comments, commissioned our own economic study of the proposal and filed extensive comments on the draft Guidance. Sierra Club and many other organizations urged the EPA to strengthen the Guidance to provide for more health and ecosystem protections in a docket submission entitled " A Giant Step Forward (9/13/93)." I am attaching the summary of these comments to my testimony. I will furnish a copy of the 200 - page document, itself, if you think it is appropriate.

I draw from Sierra Club's comments at the EPA public meeting on the Great Lakes Water Quality Guidance in Chicago last summer to summarize why the Guidance is needed and how it should be strengthened.

NEED IS CLEAR

According to the EPA National Water Quality Inventory, 1990 Report to Congress, 67.7% or 3,288 miles of Great Lakes shoreline do not support Clean Water Act designated uses. Only 1.8% or 85 miles fully support Clean Water Act designated uses for fishing and swimming. None of the shoreline in Wisconsin, Illinois, Indiana, Michigan, and Ohio supports full Clean Water Act designations.

According to the U.S. General Accounting Office, U.S. Great Lakes polluters were LEGALLY permitted to dump 7.3 million gallons of oil, 89,000 pounds of lead, 1,935 pounds of PCBs, and 933 pounds of mercury into the Lakes in 1990.

Water Pollution, Observation on EPA's Efforts to Clean Up the Great Lakes, U.S. General Accounting Office, Testimony of Richard L. Hembra, October 1991, page 6.

To put this in perspective, the Exxon Valdez illegally dumped 11 million gallons of oil into Alaska waters and was fined about $1 billion. Each year, U.S. industries dump two-thirds that amount into the Great Lakes water supply for 25 million Americans.

Current U.S. and state water laws allow polluters to dump toxic chemicals into aquatic ecosystems which poison the food web. According to a recent International Joint Commission study, Great Lakes states now use a hodgepodge of regulations that allow dumping of persistent poisons. For example, a plant that could only dump 4 pounds of mercury into Wisconsin waters, would be allowed to dump 55 pounds in Ohio, 99 pounds of mercury in Illinois, and 323 pounds in New York.

	WISCONSIN	OHIO	ILLINOIS	NEW YORK
MERCURY PLANT CAN DUMP (IN POUNDS)	4	55	99	323

The Control of Discharge of Toxic Pollutants into the Great Lakes and their Tributaries: Development of Benchmarks, Jeffrey A. Foran, PhD., International Joint Commission, page 39.

Clearly, this jeopardizes more than the water quality, fish eaters, and wildlife. It puts industries of the clean states at an unfair competitive disadvantage. States compete for industry by jeopardizing their water supply rather than strengthening their workforce. We are promoting uniform, water quality standards that protect jobs, people, fish, and wildlife.

COSTS NOT THE ISSUE

A great deal of concern has been raised about the potential costs of the GLI. Some estimates range from $190 million by EPA to $2.2 billion by the Council of Great Lakes Governors (CGLG). We feel that the lower numbers are more appropriate based on the a study we commissioned by several University of Wisconsin Agricultural Economists (enclosed). That study indicates that the CGLG used inappropriate methodology and uncertain cost and jobs figures in presenting their findings.

The costs of doing nothing are much greater than any potential costs. The Sierra Club recently released Clean Lakes, Clean Jobs, an assessment of the costs and jobs at risk from Great Lakes pollution. It found that $95 billion in commerce and almost 3 million jobs depend on a clean, healthy Great Lakes. Strengthening the GLI is the number one thing the EPA can do today to safeguard these vital jobs and our Midwest economy.

Moreover, even if the higher number of $2.2 billion is true, that number divided among the 36 million people in the Basin is only $60 per person per year -- only $5 per month. This is a small price to pay for a cleaner, healthier Great Lakes.

JUST A FIRST STEP, GLTRI ACTION NEEDED QUICKLY

The control of persistent toxics from point sources is a great concern and the major source of pollutants into the lower lakes. This is only part of the problem.

EPA should support strong measures including the Oberstar Non-Point bill (H.R. 2543) to clean up and slow toxic run-off and the Metzembaum-Glenn Great Lakes Clean Water Quality Amendments (S. 1183), to clean up toxic sediments lining our harbors, and recommend regulations to cut toxic air emission when they publish the Great Waters Study this fall.

The EPA should also move forward with the Great Lakes Toxics Reduction Initiative (GLTRI) before the final GLI is published to ensure that all sources of persistent toxics are reduced to share the burden with all culprits.

CONCLUSION

In conclusion, Sierra Club supports Great Lakes - type federal environmental programs in the Gulf of Mexico and other large regional bodies of water if these programs' missions are to meet specific health and

environmental objectives. Sierra Club strongly supports the Great Lakes Initiative. We look forward to working with your two Subcommittees to clean up America's Great Waters.

U.S. House of Representatives
Committee on
Merchant Marine and Fisheries
Room 1334, Longworth House Office Building
Washington, DC 20515-6230

March 21, 1993

BACKGROUND MEMORANDUM

TO: Members, Subcommittee on Oceanography, Gulf of Mexico, and the Outer Continental Shelf

Members, Subcommittee on Environment and Natural Resources

FROM: Subcommittee Staff

SUBJECT: Oversight of the Great Lakes Program and its Applicability to Other Regional Programs

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On Thursday, March 24, at 10:00 AM in 1334 Longworth House Office Building, the Subcommittee on Oceanography, Gulf of Mexico, and the Outer Continental Shelf, and the Subcommittee on Environment and Natural Resources will meet to receive testimony on the Great Lakes Program and its applicability to other regional bodies of water. Witnesses will include representatives from the U.S. Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration, the Great Lakes Commission, industry, and the environmental community.

BACKGROUND

Environmental Issues Facing the Great Lakes

Concern over water quality in the Great Lakes has a long history. In 1909, the United States and Canada signed the Boundary Waters Treaty, creating the International Joint Commission (IJC) as a binational body with the authority to resolve disputes over the use of water resources, carry out studies, and advise the U.S. and Canadian governments on pollution-related problems. The 1972 Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada was aimed at protecting the Great Lakes from the effects of pollution, primarily nutrient loadings. The Agreement also provided for joint monitoring and surveillance programs to be coordinated through the IJC.

The Agreement was amended in 1978 in an attempt to address toxic pollutants in the Lakes. The 1978 amendments called for the virtual elimination of the discharge of persistent toxic chemicals. The Agreement also set targets for phosphorous loads to each Lake. In addition, the 1978 amendments emphasized that the purpose of the Agreement was to protect the entire Great Lakes ecosystem. In 1987, the Agreement was amended again to clarify the role of the U.S. and Canadian governments and the IJC with regard to the control of toxic substances and other pollutants. Among other provisions, the 1987 amendments set out minimum numerical and narrative water quality standards for the United States and Canada.

In 1986, the Governors of the eight Great Lakes states signed the Great Lakes Toxic Substances Control Agreement in an attempt to lay the groundwork for uniform water quality standards for the Great Lakes. The Governors' goal was consistency in both environmental protection and economic competitiveness, to ensure that there would be no market-driven incentives to move facilities to a state with less stringent standards.

The 1987 amendments to the Clean Water Act formally established the Great Lakes National Program Office (GLNPO) within EPA. The GLNPO had been created in 1978 in EPA's Region V office in Chicago as the focal point to plan, coordinate, and oversee cleanup efforts by EPA divisions, other federal agencies, and the Great Lakes states. Under the 1987 Clean Water Act amendments, the GLNPO was directed to develop and implement specific action plans to carry out the responsibilities of the United States under the GLWQA. Essentially, the 1987 amendments required the GLNPO to identify problems regarding the Lakes, coordinate the activities of the various local, state, federal, and binational organizations whose activities were aimed at improving the quality of the Lakes, and report to Congress on progress made in implementing the GLWQA.

In 1989, EPA Region 5 initiated the effort known as the Great Lakes Water Quality Initiative. This effort was aimed at providing a forum for state and EPA development of uniform water quality standards for the entire Great Lakes basin. The results of the effort were to be used as a basis for revising state water quality standards under the Clean Water Act and negotiating revised water quality objectives with the Canadian government under the GLWQA.

In 1990, Congress passed the Great Lakes Critical Programs Act (P.L. 101-596), which formalized and established deadlines for the Great Lakes Water Quality Initiative. This Act, which amended section 118 of the Clean Water Act, was intended to improve the effectiveness of EPA's existing programs in the Great Lakes by identifying key treaty agreements between the United States and Canada contained in the GLWQA, imposing statutory deadlines for the implementation of such key activities, and increasing federal resources for program operations in the Great Lakes.

Specifically, section 101 of the Critical Programs Act required EPA, by June 30, 1991, to publish proposed water quality guidance for the Great Lakes which conformed with the objectives and provisions of the GLWQA and was no less restrictive than provisions

of the Clean Water Act and national water quality criteria and guidance. This guidance was to specify minimum requirements in three areas: water quality standards, antidegradation policies, and implementation procedures. EPA was to publish the final Great Lakes Guidance by June 30, 1992.

EPA did not publish the proposed Great Lakes Water Quality Guidance in the Federal Register until April 16, 1993 (58 FR 20802). It is expected that the final Guidance will be published in early 1995. Within two years after publication of the final guidance, the Great Lakes states are required to adopt, for state waters within the Great Lakes basin, water quality standards, antidegradation policies, and implementation procedures that are consistent with the final Guidance.

Focus of the Great Lakes Initiative

The Great Lakes National Program Office established three committees to develop the Great Lakes Water Quality Initiative. A Steering Committee, comprised of directors of water programs from EPA's national and regional offices and the Great Lakes states' environmental agencies, discussed policy, scientific, and technical issues and directed the efforts of the Technical Work Group. The Technical Work group, comprised of staff from the Great Lakes states environmental agencies, EPA, the U.S. Fish and Wildlife Service, and the U.S. National Park Service, prepared proposals for submission to the Steering Committee. Finally, the Public Participation Group, comprised of representatives of environmental organizations, municipalities, industry, and academia, observed the efforts of the other two groups, advised them of the public's concerns, and kept its constituencies informed of activities related to the Initiative.

The Steering Committee was particularly concerned about persistent pollutants that have a propensity to bioaccumulate in the food chain. This Committee decided that efforts should be focused on further reducing the loadings of these pollutants from all sources. In selecting and ranking the pollutants that warranted additional controls, the Technical Work Group thus focused on a pollutant's ability to persist in the Great Lakes and bioaccumulate in the food chain. This process resulted in the selection of 28 chemicals as "bioaccumulative contaminants of concern" (BCCs) and ten additional chemicals as potential BCCs, for which extremely stringent implementation and antidegradation rules will apply.

In total, the Guidance focuses on 138 pollutants identified by the Steering Committee as pollutants known or suspected of being of primary concern in the Great Lakes basin. This list includes pollutants identified by EPA as priority toxic pollutants, pollutants listed in Annex 1 of the GLWQA for which there are "Specific Objectives", pollutants listed under the Lake Ontario Toxics Management Plan or the Niagara Toxics Management Plan, and pollutants listed on a case-by-case basis. The primary purpose of specifying pollutants in the Initiative was to provide an initial focus for criteria development.

The proposed Great Lakes Water Quality Guidance outlines water quality criteria applicable to the entire Great Lakes basin, including numerical limits on pollutants in Great Lakes waters to protect human health, aquatic life, and wildlife. In addition, the Guidance specifies antidegradation policies intended to ensure that improvements in water quality are protected and maintained. Finally, the Guidance outlines implementation procedures for Great Lakes states, requiring each state to adopt and implement a policy that is consistent with the requirements set forth in the Guidance.

<u>Other Regional Programs</u>

Gulf of Maine Program

Other regional programs have been established throughout the United States to address concerns regarding various regional bodies of water. The Gulf of Maine Program, established in 1989, is a cooperative effort among the Provinces of Nova Scotia and New Brunswick, the States of Maine and New Hampshire, and the Commonwealth of Massachusetts to protect the integrity of the Gulf of Maine region. This program seeks to increase cooperation among the many state, provincial, and federal agencies with jurisdiction in the Gulf of Maine, concentrating efforts on pollution prevention within the extensive watershed. The Program established the Gulf of Maine Council on the Marine Environment to coordinate the policies and activities of the multiple agencies and scientific, environmental, and marine trade organizations active in the region. Organizations involved in the effort are currently seeking Congressional authorization and appropriation for the Gulf of Maine Program.

Gulf of Mexico Program

The Gulf of Mexico Program (GMP) was established in 1988 in response to concerns that the health and productivity of the region was deteriorating, in part due to increases in population along the Gulf Coast and growing demand for Gulf resources. Degradation of Gulf marine and coastal resources and habitat has been caused by marine debris, toxic substances and pesticides, coastal and shoreline erosion, nutrient enrichment, freshwater intrusion, nonpoint source runoff, and contaminants from inefficient or non-existent septic systems. In recent years, these factors have precipitated decreases in waterfowl and marine wildlife, increased degradation and loss of wetlands and other habitat, and threats to human health.

The GMP was established by EPA Regions 4 and 6 as a multistate, interagency effort to develop and implement a comprehensive strategy for protecting, restoring, and maintaining the health and productivity of the Gulf of Mexico. The Program is intended to serve as a catalyst to promote sharing of information, pooling of resources, and coordination of efforts to restore and reclaim wetlands and wildlife habitat, clean up existing pollution, and prevent future contamination and destruction of Gulf resources. The GMP Office is located at the Stennis Space Center in Mississippi.

As the GMP is not specifically authorized by law, it is being carried out administratively and in voluntary partnership with the Gulf states and several federal agencies. In December 1992, the Governors of the five Gulf states and representatives of the EPA, the Department of the Army (on behalf of Corps of Engineers), Department of the Interior (on behalf of the Fish and Wildlife Service, Minerals Management Service, National Park Service, and U.S. Geological Service), the Department of Transportation (on behalf of the U.S. Coast Guard), the U.S. Department of Agriculture (on behalf of the Soil Conservation Service), and the Department of Commerce (on behalf of the National Oceanic and Atmospheric Administration) signed a voluntary "Partnership for Action," articulating the goals and objectives of the GMP.

Currently, the GMP is administered by an EPA-chaired policy review board (which guides and reviews all program activities), an EPA-chaired management committee, an EPA-chaired technical advisory committee (which evaluates environmental problems and develops regulatory strategies), and a citizen advisory committee. Each committee is divided into issue-based subcommittees which are charged with developing an action agenda to define the problems, set goals and objectives for solving the problems, and propose specific strategies for accomplishing these goals. In December 1992, GMP participants identified ten goals upon which to focus their efforts in the following five years. These goals address coastal wetlands loss, Gulf Coast sea grass beds, commercial and recreational fisheries, shellfish beds, beach safety, debris on beaches, coastal habitats, public education and outreach, critical coastal and shoreline erosion, and the input of toxic substances, nutrients, and pathogens into the Gulf.

Legislative Action Related to the Gulf of Mexico

During the first session of the 103d Congress, several pieces of legislation related to the Gulf of Mexico were introduced. Sen. Gramm introduced the Gulf of Mexico Preservation Act of 1993, S. 83, on January 21, 1993. This bill would establish a domestic Gulf of Mexico Program within the EPA to protect the aesthetic, environmental, and economic resources of the Gulf, and establish a Gulf of Mexico Program Office within EPA to carry out the Act.

On March 31, 1993, Sen. Krueger introduced S. 686, the Gulf of Mexico Act of 1993. This legislation would establish a Gulf of Mexico Commission and establish a Gulf of Mexico Program Office within the EPA.

On March 31, 1993, Rep. de la Garza introduced H.R. 1566, the Gulf of Mexico Act of 1993. This bill is intended to amend wetland conservation provisions of the Food Security Act of 1985, establish a Gulf of Mexico Commission, and establish a Gulf of Mexico Program Office within the Environmental Protection Agency.

Finally, on April 28, 1993, Rep. Laughlin introduced H.R. 1899, the Gulf of Mexico Economic and Environmental Protection Act of 1993. This bill is similar to the bill Rep. Laughlin introduced in

the 102d Congress (H.R. 5441). The purpose of H.R. 1899 is to establish a comprehensive Gulf program to coordinate the marine and coastal activities of Federal, state, and local governments, and develop a comprehensive joint plan for economic and environmental protection of the Gulf.

During the second session of the 103d Congress, language concerning the Gulf of Mexico has been added to S. 1114, the Water Pollution Prevention and Control Act of 1993, introduced by Sen. Baucus on June 15, 1993. Section 1001 of S. 1114 establishes a Gulf of Mexico Program under the lead of the EPA, sets up a Gulf of Mexico Commission and a Management and Policy Review Committee, and requires that a comprehensive Management and Restoration Plan be developed for the Gulf of Mexico.

ISSUES

1) Are the federal agencies coordinating their activities effectively in the Great Lakes basin?

2) Are the federal agencies properly addressing the environmental and economic needs of the Great Lakes basin? Are federal resources being spent in the most effective manner possible?

3) Is the Great Lakes Water Quality Guidance what was envisioned when the Great Lakes Initiative process commenced in 1989?

4) The Great Lakes Guidance does not directly address nonpoint sources of pollution, which, by some estimations, account for approximately 90 percent of all pollutant inputs to the Great Lakes. Do the benefits of the Guidance justify this focus on point sources which are already regulated under the National Pollutant Discharge Elimination System permitting regime?

5) Will implementation of the Guidance accomplish the goal of significantly improving water quality in the Great Lakes?

6) Should the process used to develop the Great Lakes Water Quality Guidance be used as a model for developing other regional programs? Were all interests fairly represented throughout the process?

7) How accurate is EPA's $200 million estimate for the costs of implementing the Great Lakes Guidance? A study conducted for the Council of Great Lakes Governors estimates that industry and government could pay up to $2.3 billion a year to comply with the regulations -- how can the discrepancy between these two figures be explained?

8) Is the Great Lakes Program an appropriate model for other regional bodies of water?

9) Is it possible that one of the outcomes of a formally authorized Gulf of Mexico Program could be uniform water quality standards for the Gulf states?

10) Are uniform water quality standards necessary to remove market-driven incentives to move facilities to states with less stringent standards? Do any such incentives currently exist with regard to the Gulf of Mexico region? Is there any potential for such incentives to arise in the future?

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CONGRESSIONAL
AND LEGISLATIVE AFFAIRS

June 23, 1994

The Honorable Solomon P. Ortiz
Chairman
Subcommittee on Oceanography, Gulf of Mexico,
and the Outer Continental Shelf
Committee on Merchant Marine and Fisheries
United States House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Enclosed, for insertion into the hearing record, are the responses to the questions you forwarded to Jim Giattina following the hearing on the Great Lakes Program and its applicability to other regional programs. These responses were prepared by EPA's Region 5, the Great Lakes National Program Office, the Gulf of Mexico Program Office and the Office of Water.

I hope this information will be useful to you and members of the Committee. Please feel free to contact me if I can be of any further assistance.

Sincerely,

Christopher P. Hoff

Christopher P. Hoff
Deputy Director
Legislative Analysis Division

Enclosure

EPA RESPONSES TO SUPPLEMENTAL QUESTIONS FOR CONGRESSMAN SOLOMON P. ORTIZ, CHAIRMAN HOUSE MERCHANT MARINE COMMITTEE SUBCOMMITEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF FROM THE MARCH 24, 1994 HEARING ON THE GREAT LAKES PROGRAM

1. Is the Great Lakes Water Quality Guidance what was envisioned when the Great Lakes Initiative began in 1989?

Yes, the substantive content of the proposed Guidance meets, and in many ways, exceeds the initial 1989 expectations for the original Great Lakes Water Quality Initiative. The proposed Guidance includes minimum water quality criteria and methodologies, antidegradation policies, and implementation procedures that were, for the most part, initially developed through an open, collaborative process by staff from the Great Lakes States with input from other stakeholders in the Basin. The principal changes that have occurred since the initial planning for the Initiative result from the enactment in 1990 of the Great Lakes Critical Programs Act. For example, pursuant to the Act, the States must adopt provisions which are consistent with the final Guidance within 2 years of EPA's publication of the final Guidance. If they do not, EPA must promulgate the provisions.

2. Are the federal agencies coordinating their activities effectively in the Great Lakes Basin? What steps, if any, could be taken to improve coordination?

Several binational institutional mechanisms exist to coordinate the United States' and Canada's pollution control activities along the border and in the Great Lakes Basin at the Federal, State, and Provincial levels:

(1) The Binational Executive Committee (BEC): The BEC is a forum for the United States and Canada to carry out Party to Party discussions under the Great Lakes Water Quality Agreement (GLWQA). The BEC is composed of representatives from federal, state, and provincial pollution control and natural resource agencies on each side of the border. The BEC establishes binational priorities for joint actions carried out by the two countries to implement the GLWQA; establishes joint, ad hoc work groups, as necessary, to implement the joint actions; and oversees the execution of the priority actions. On the United States' side, the following agencies, in addition to EPA, participate on the BEC: the National Oceanic and Atmospheric Administration (NOAA), the Army Corps of Engineers (ACE), the Coast Guard, the Department of Agriculture (DOA), the State Department, the Fish and Wildlife Service (FWS), the Michigan Department of Natural Resources, the Wisconsin Department of Natural Resources, and the Minnesota Pollution Control Agency. In the future, all eight Great Lakes States will be given the opportunity to participate on the BEC.

(2) The Bilateral Air Quality Committee: This Committee assists in the implementation of the United States - Canada Air Quality Agreement (AQA) and addresses shared concerns regarding transboundary air pollution. The Committee is co-chaired by the U.S. State Department and the following agencies participate on the committee in addition to EPA: the Department of Energy, the Department of Interior, and NOAA. The United States - Canada AQA Progress Report, issued jointly by both governments, covers policy and technical issues, and provides a mechanism for the two governments to work effectively to address acid rain and air toxics problems.

(3) In 1985, EPA and Environment Canada signed a Memorandum of Understanding on "Inland Border Hazardous Material Issues" as a mechanism to address the transport of hazardous materials. The Office of Solid Waste and Emergency Response is the lead office on the initiative which compliments the United States -Canada Marine Response Agreement. In addition, various States have entered separate agreements with bordering Provinces concerning the transport of hazardous waste across their mutual territories.

In addition to the above binational entities, United States' actions under the GLWQA are coordinated under the U.S. Policy Committee. In addition to EPA, participants on this committee include the environmental agencies from the eight Great Lakes States, the ACE, FWS, NOAA, the Forest Service, DOA, Coast Guard, and the State Department. The Policy Committee is responsible for overseeing the development and implementation of the Great Lakes Five Year Strategy.

These institutional mechanisms have led to effective coordination of federal and state activities within the Basin. To further improve coordination among the programs and agencies within the United States, EPA will, in the next several months, be proposing an organizational body to replace the U.S. Policy Committee. This forum, assuming it is agreed to by the member organizations, will expand representation to include more active participation by natural resource and fishery management agencies. This will allow more effective discussion and coordination of activities to address the full range of chemical (e.g., nutrient and toxic pollution), physical (e.g., habitat destruction), and biological stresses (e.g., exotic species introductions) impacting the Great Lakes ecosystem.

3. How accurate is EPA's $200 million estimate for the costs of implementing the Great Lakes Guidance? A study conducted for the Council of Great Lakes Governors estimates that industry and government could pay up to $2.3 billion a year to comply with the regulations -- how can the discrepancy between these two figures be explained?

EPA's analysis to support the proposed Guidance estimated the annualized cost to point source dischargers in the Great Lakes Basin to implement the requirements of the proposed Guidance will be between $80 million and $505 million. The costs of

the most likely implementation scenario were estimated to be $230 million per year. Although the analysis made simplifying assumptions and was subject to limitations discussed in the proposal, EPA believes the analysis represents a reasonable estimate. The proposed Guidance also contains several provisions that are available to the States which may decrease compliance costs, including site specific modifications to, or variances from, water quality criteria; compliance schedules; and development of phased total maximum daily loads (TMDLs). The potential decreased compliance costs attributable to each one of these mechanisms was not included in the cost study.

In addition, there are several other types of compliance costs not addressed in the GLWQG cost study. The costs related to the elimination of mixing zones for BCCs and the costs related to the prevalence of Tier II BCCs have not been estimated by EPA, although the Agency expects these costs to not be significant. EPA has not developed quantitative estimates of costs related to intake credits options, although the Agency believes that its proposal on intake credits can lead either to cost savings or to increased costs. Finally, the impact of the GLI antidegradation provisions on any existing State regulatory programs to control non-point sources were not quantified. The discrepancy between EPA's cost estimate and the estimate of the Council of Great Lakes Governors that you cite appears to stem from the fact that the Council, unlike EPA, generated cost estimates for the elimination of mixing zones for BCCs, and for the intake credit alternative discussed in the proposal, including the worst-case option. In addition, the Council generated cost estimates for antidegradation and for the mercury wildlife criteria that are much larger than those reported in the EPA study due to different assumptions in the changes in analytical detection limits over time. EPA is continuing to update and expand its own estimates of the costs of these provisions.

The Agency has also assessed benefits for three sites in the Great Lakes system. Using the three case study sites, EPA estimated benefits for the following categories: recreational fishing, recreational boating and swimming, subsistence fishing, commercial fisheries, waterfowl and other hunting, non-consumptive wildlife observation, human health benefits, nonuse/ecologic values, and dredging/navigation. Where numbers could not be developed for a category, potential benefits were discussed in qualitative terms for the proposal. The three case studies indicate that quantified benefits from the proposed Guidance were commensurate with the quantified costs. The most significant benefits were attributed to reduction in bioaccumulative pollutants impacting recreational fishing and non-use/ecologic benefits.

As EPA works to develop the final rule, we will be updating and expanding the analysis to include information on both costs and benefits from the public comments. We will review not only the costs and benefits of alternative approaches, but also the basis for our estimates. Our initial review of over 23,000 pages of information and data from approximately 5,800 respondents indicates that many commenters have

provided views, facts, and data on these issues. For example, some commenters believe our cost estimates are too high, while others believe they are too low. The study commissioned by the Council of Great Lakes Governors concluded that costs attributed to the GLI will range between $710 million and $2.3 billion per year. As part of our review, EPA will give careful consideration to all public comments, including the analysis by the Council.

4. Is the Great Lakes Program an appropriate model for other regional bodies of water? What changes might be necessary in implementing a regional program for the Gulf of Mexico?

There are elements of the Great Lakes Program that can serve as models for other regional initiatives. However, each is unique and requires creative mechanisms that involve stakeholders and state and local governments in a management structure. For example, the establishment of multi-year strategies with clear environmental goals and priorities for restoring or protecting the waterbody, and development of a realistic schedule for completion of activities that support these goals and priorities are appropriate for many regional initiatives.

While the Gulf of Mexico Program and the Great Lakes Program share many similarities, particularly with regard to international interests, they are dissimilar in many ways and require different approaches to their management. Therefore, any prototype would require flexible tailoring to the specific environmental, cultural, political, physiographic, and economic conditions of the specific waterbody.

Environmental measures in the Gulf differ from the Great Lakes Program because The Gulf of Mexico is a myriad of nested ecosystems strongly affected by the marine processes while the Great Lakes are entirely freshwater in character. The marine characteristics of the Gulf present a different set of parameters in its pollution chemistry and require the use of water quality standards that differ from those developed for freshwater lake systems.

Whereas the Great Lakes and Gulf programs are both concerned with pollution from persistent, bioaccumulative industrial and agricultural toxicants, the Great Lakes Program has been in existence for a longer period of time and has had the opportunity to develop a strong consensus regarding the need to address toxic pollution along with other key ecological threats including habitat alteration and destruction, and exotic species introductions. The Gulf of Mexico program has numerous identified issue areas including: marine debris, habitat degradation, coastal and shoreline erosion, public health, living aquatic resources, freshwater inflow, and nutrient enrichment. However, a consensus of priorities within and across issue areas has not yet been developed.

Differences in the specific characteristics of the drainage Basins, ratio of land to water, and estuarine vs. freshwater nature generate different needs and priorities. Furthermore, the commitments resulting from international or interstate agreements and legislation differ in complexity, specificity and accountability.

The Gulf of Mexico Program must share responsibility for restoration of the Gulf ecosystem with Mexico, Cuba and the entire Wider Caribbean area. These shared planning and implementation efforts require multinational coordination structures.

5. Would uniform water quality standards be appropriate for states bordering other regional bodies of water, like the Gulf of Mexico?

An aggressive effort to adopt uniform water quality standards for States bordering the Gulf of Mexico would not be appropriate. The nature of the priority water quality problems in the Gulf ecosystem are not as uniform throughout the States bordering the Gulf as they are among the Great Lakes States. As a result, the nature of the water quality standards needed to protect the ecosystem will vary from State to State. If there are situations where more uniformity is needed between the standards of neighboring States sharing common water quality problems, EPA can work with those States as part of the triennial water quality standards review process under section 303(c) to improve uniformity. At the same time, the Gulf States are also continuing to work towards more uniform water quality monitoring which will allow for a more common understanding of the various water quality problems in the Gulf ecosystem.

6. Do you foresee uniform water quality standards, similar to those being proposed for the Great Lakes, as one of the outcomes of a formally authorized Gulf of Mexico Program?

As stated above, EPA would not recommend an effort to adopt uniform water quality standards for States bordering the Gulf of Mexico.

7. How well does the overall Great Lakes Program address non-point sources of pollution? The Great Lakes Guidance does not directly address non-point sources, which, by some estimations, account for as much as 90 percent of all pollutant inputs to the Great Lakes. Do the benefits of the Guidance justify this focus on point sources which already are regulated under the National Pollutant Discharges Elimination System permitting scheme?

Since 1972, EPA and the States have been actively involved in point and non-point source projects within the Great Lakes Basin (Section 108 of the Clean Water Act)

that demonstrated agricultural pollution control and mitigated impacts caused by urban development (e.g., construction sites, combined sewer overflows, sewage sludge utilization). Many of these activities include habitat restoration components that have been adopted by Federal and State land managers, conservation agencies, and individual landowners. Much of this early work provided the basis for the best management practices which are integral to the implementation of the non-point source program under Section 319 of the Clean Water Act (CWA).

Each of the Great Lakes States has a high quality non-point source assessment and management program in place. The Great Lakes States are active in monitoring non-point sources, implementing management practices to control or eliminate pollution from such sources, and conducting education programs and community outreach efforts.

In addition, EPA and the States, through the Great Lakes Program and other national efforts, are addressing a variety of sources of water pollution using existing legislative and enforcement authorities under a number of environmental statutes. The following actions are just a few examples of Federal and State actions to reduce pollution from sources other than point source wastewater discharges:

- In 1993, remediation of the Waukegan Harbor, Illinois, Superfund site was completed, resulting in the removal of 300,000 pounds of polychlorinated biphenyls (PCBs) from the Lake Michigan system.

- Agreement by a steel company with a facility located in Northwest Indiana to expend $49.5 million in environmental improvements, sediment clean-up, and civil penalties. EPA estimates that as much as 750,000 cubic yards of contaminated sediments may be cleaned-up, which could entail removal of over 2.5 million pounds of zinc and 5,000 pounds of PCBs, along with a variety of other contaminants.

- Removal of approximately 35,000 cubic yards of contaminated bottom sediments from tributaries to the Niagara River which has significantly reduced the input of PCBs and other contaminants into Lake Ontario.

- Utilities serving the Great Lakes have voluntarily accelerated the phase-out of electrical equipment containing PCBs to prevent the possibility of accidental spills. The industry estimates that approximately 17 million pounds (87 percent of the PCBs previously in use by this industry) have been removed from service.

- State agriculture departments with support from EPA have conducted "clean sweeps" in counties within the Great Lakes Basin. This program allows holders of pesticide stocks to turn in unused amounts for proper disposal. In 1992, such sweeps in the watersheds of Lakes Michigan and Superior yielded more

than 5,000 pounds of dieldrin, aldrin, endrin, chlordane, and chlordecone (kepone), plus greater than 4,500 pounds of DDT. To put this quantity of DDT in perspective, a rough estimate of the annual loading of DDT to these two lakes via the atmosphere is about 58 pounds. Thus, in one year, the collection program prevented the potential release of a quantity of DDT equal to approximately 75 years of atmospheric deposition to these lakes.

Many of the actions noted above have been identified and supported through the Lakewide Management Planning and Remedial Action Planning processes called for under Annex 2 of the Great Lakes Water Quality Agreement and Section 118 of the CWA. In addition, as noted in my written testimony, EPA successfully completed the Assessment and Remediation of Contaminated Sediments (ARCS) Program, a five-year demonstration program to identify and develop assessment and treatment technologies for contaminated sediments in the Great Lakes Basin. Further efforts by EPA to address non-point sources of pollution are discussed in response to Question 19 below.

In regard to your question about the Great Lakes Guidance, we believe the Guidance does address non-point source pollution in the Great Lakes System. The criteria to protect aquatic life, human health, and wildlife in the proposed Guidance would apply to the waters of the Great Lakes System, regardless of the source (point or non-point) of pollutants to those waters. Other specific procedures of the proposed Guidance also recognize non-point source contributions by establishing procedures to allocate the available load capacity of the receiving water among all sources of the pollutant, including non-point sources (total maximum daily loads); and allowing permit authorities to grant variances from water quality criteria or consider the presence of intake water pollutants in a facility's discharge under specified circumstances. In addition, any existing State regulatory programs controlling non-point sources that require compliance with water quality standards would also be subject to the antidegradation procedures in the proposed Guidance. These programs, combined with voluntary programs, such as Lakewide Management Plans and Remedial Action Plans, are designed to address a range of problems associated with agricultural non-point sources, air deposition, contaminated sediments, hazardous waste sites, spills due to storage, handling or transport activities, and wet-weather point source discharges. EPA plans to work with the States to develop approaches to implement these regulatory and voluntary programs. These programs, together with the final Guidance, should help restore and maintain the quality of waters in the Great Lakes system.

8. To what extent have user groups, environmental organizations, industry, and concerned citizens been involved in the Great Lakes Program? With respect to the development of the Great Lakes Water Quality Guidance, how much input did these different groups have? Was it your impression that these different groups generally

were satisfied with their level of input and influence?

Public participation and public education is an important element of the Great Lakes Program. For example, the Assessment and Remediation of Contaminated Sediments (ARCS) Program maintained a great amount of public outreach and involvement throughout the study. Numerous environmental and public interest groups assisted the ARCS Program in defining the nature and extent of the sediment contamination problem and the appropriate assessment and remediation study activities on which to focus. Each of three ARCS technical work groups included a representative from an environmental organization. Additionally, a Communication/Liaison Work Group was established that included members from public interest groups, Federal and State agencies, and individual citizens who live in the vicinity of the Areas of Concern targeted for pilot scale remedial demonstrations. The Work Group's goal was to both provide input to the technical Work Groups on what the most pressing issues and concerns were to the public regarding contaminated sediments, and to provide a conduit for transmitting information generated by the ARCS Program to the interested public.

Information on the ARCS Program activities has been widely distributed to the public in the form of ARCS Update fact sheets, news releases, a slide show, and public meetings. The ARCS Program has made all written documentation accessible by setting up repositories for ARCS Program materials in local libraries at the five ARCS priority locations. Workshops were held to communicate ARCS Program efforts to State RAP coordinators. Through all of these activities, the ARCS Program solicited and received public input.

During 1992 and 1993, EPA's research vessel, the R/V Lake Guardian, conducted educational tours for the public at 30 ports across the Great Lakes Basin. Close to 20,000 visitors toured the ship and learned about environmental problems confronting the Lakes and steps being taken to address those problems.

During the fall of 1993, EPA initiated a virtual elimination project (discussed further in response to question 19) to develop options for improving the current regulatory and non-regulatory framework to encourage reductions of selected toxic chemicals in the Great Lakes Basin from all sources. EPA is involving the public in various ways, including:

- initiating the project by inviting over 70 individuals from industry, environmental groups, local and state governments, utilities, other Federal agencies, and the public at large to a public meeting to provide comments and insight on the scope and direction of the project;

- providing informational status reports on progress to participants as well as to other interested parties;

- implementing a public outreach strategy that seeks to disseminate information and provide an avenue for receiving comments about the project from as many stakeholders and interested parties as possible; and

- convening a follow-up meeting during the summer of 1994 to jointly guide project implementation.

The open dialogue used in the Great Lakes Water Quality Initiative has been exemplary and is, we believe, a model for future activities. From the outset, States, local governments, and other members of the public have been participants in the process. Three committees were formed under the Initiative. A Steering Committee, consisting of directors of water programs from EPA's national and regional offices and the Great Lakes States' environmental agencies (as co-regulators of Clean Water Act water quality programs), discussed policy, scientific, and technical issues and directed the work of the Technical Work Group. The Technical Work Group (consisting of technical staff from the Great Lakes States' environmental agencies, EPA, the U.S. Fish and Wildlife Service and the U.S. National Park Service) prepared proposals for submission to the Steering Committee. The Public Participation Group (consisting of representatives from environmental groups, municipalities, industry, and academia) observed the deliberations of the other two groups, advised them of the public's concerns, and kept its various constituencies apprised of Initiative activities. It is our impression that most participants seem pleased with their level of involvement in the development of the draft guidance.

9. Did the Great Lakes Initiative perform a comprehensive scientific study of the sources, magnitudes, and types of pollution in the waters and sediments of the Great Lakes before developing a list of chemicals of concern?

One of the benefits of the State/EPA/public working relationship used to develop the proposed guidance was that we were able to tap many sources of information and expertise to assist in our deliberations. Such was the case with the development of the list of chemicals of concern. Extensive literature exists on the nature and causes of impairments in the Great Lakes, and participants in the workgroups were familiar with, or had assisted in the development of, this body of literature. The professional judgement of these experts was relied upon to distinguish those chemicals which appear to provide the greatest threats to the Great Lakes Ecosystem. Another integral part in the development of this list was the development of a methodology for deriving Bioaccumulation Factors. This was a collaborative effort of numerous scientific experts from many States and EPA.

10. Should the process used to develop the Great Lakes Water Quality Guidance be used as a model for developing other regional programs?

The proposed Great Lakes Water Quality Guidance is the result of a four-year cooperative effort among the eight Great Lakes States, the environmental community, academia, industry, municipalities, and EPA. The Great Lakes Initiative process was tailored to the specific problems being addressed and the institutional structures available and appropriate to the Great Lakes Basin, and may not be directly applicable without modification or adaptation in other areas. Nevertheless, the open dialogue used in this effort has been exemplary and is a model for the future.

11. Will implementation of the Guidance accomplish the goal of significantly improving water quality in the Great Lakes?

Implementation of the Guidance, by itself, will not solve all of the water quality problems in the Great Lakes Basin. Nevertheless, by establishing numeric water quality criteria and values for the protection of aquatic life, wildlife and human health which apply to the ambient waters of the Great Lakes System, regardless of the source of pollutants to those waters, the proposed Guidance provides the basis for integrating actions carried out under the range of environmental programs available to Federal, State and Tribal regulators in order to protect and restore the Great Lakes Basin Ecosystem. Some of these other programs, which are being coordinated and integrated under the Great Lakes Five-Year Strategy, include: the Great Lakes Pollution Prevention Action Plan; Lakewide Management Plans; Remedial Action Plans; the Great Lakes Toxics Reduction Effort; efforts to address and prevent problems from contaminated sediments, atmospheric deposition, storm water, combined sewer overflows, discharges of oil and hazardous polluting substances, and non-point sources of pollution from land-use activities; and efforts to improve the system for developing fish advisories, and ongoing environmental monitoring and data management programs.

12. Under the proposed Great Lakes Water Quality Guidance, why has EPA proposed to restrict the size of the mixing zone for non-BCCs and phase out the use of the mixing zone for BCCs? What sort of impact will these restrictions have on industries and municipalities? Inasmuch as current EPA guidance allows the use of mixing zones as a viable pollution tool, what changed EPA's thinking with regard to this issue?

The proposed Guidance presented one option that would restrict the introduction and accumulation of Bioaccumulative Chemicals of Concern (BCCs) in the Great Lakes System by requiring, in general, that mixing zones for existing discharges of BCCs be eliminated within 10 years and, for new sources, that no mixing zone be provided. This proposed restriction reflects the Steering Committee's belief that every reasonable effort should be made to reduce all loadings of BCCs. In particular, the Steering Committee believed mixing zones should be eliminated for BCCs as a way to reduce mass loadings to the Great Lakes. In addition, this recommendation is

consistent with the Great Lakes Governors Toxic Substances Control Agreement calling for the continued reduction of toxics in the Great Lakes System to the maximum extent possible, and the Clean Water Act goal of fishable waters. For BCCs, EPA has not developed numerical estimates of the cost to industries and municipalities of eliminating mixing zones. For nonBCCs, EPA does not believe that the mixing zone requirements are significantly different from the National program being implemented by the Great Lakes States, and therefore, should have minimal cost impact on industries and municipalities. EPA received numerous comments on this issue and is in the process of evaluating all possible options and the potential impacts of these options on industries and municipalities.

The elimination of mixing zones for BCCs in the Great Lakes system is consistent with current National regulations and guidance and the Great Lakes Water Quality Agreement. EPA regulations provide that States may, at their discretion, provide for mixing zones as part of their State water quality standards. EPA's 1991 guidance document, "Technical Support Document for Water Quality-based Toxics Control," recommends that States provide a definitive statement in their water quality standards as to whether or not mixing zones are allowed and states that, as our understanding of pollutant impacts on ecological systems evolves, there may be cases identified where mixing zones are not appropriate and should not be allowed. The Great Lakes Water Quality Agreement supports the elimination of point source impact zones (mixing zones) for toxic substances (GLWQA at Annex 2 Paragraph 2.(d)).

13. How does disallowing or restricting the size of mixing zones significantly lower the degree of risk to wildlife and human health? If overall concentrations of chemicals of concern would not increase by allowing mixing zones, why would health risks increase? How would EPA respond to the charge that the Initiative's intake credit policy requires expensive process changes without significant health benefits?

Mixing zones are areas within the water body where the effluent mixes with the receiving water and where chronic, and in some cases acute, water quality standards are not required to be met. In effect, the receiving water is used to dilute the effluent to achieve water quality standards in the water body instead of requiring additional treatment to attain standards in the effluent or at the point of discharge. Thus, mixing zones are areas within the receiving water where increased risk of toxicity may occur to the detriment of the ecosystem because the concentration of the pollutant can sometimes significantly exceed, depending upon dilution variability, the water quality standard. While the water quality standard (concentration of pollutant) should, in theory, be achieved at the edge of the mixing zone, discharge and receiving water dynamics can alter the shape and size of the mixing zone, as well as the concentration of the pollutant in it.

By decreasing the size of the mixing zone and, thereby, the volume of receiving water

dilution, permitting authorities require dischargers to decrease the concentration of the pollutant in its effluent. As the concentration of the pollutant in the effluent is decreased, so is the mass of the pollutant entering the ecosystem. For pollutants that rapidly biodegrade in the environment without significantly depleting oxygen in the receiving water, increased mass may not be a serious problem, but for persistent pollutants, such as metals (e.g., cadmium, lead, etc.), or pollutants that bioaccumulate in the food chain, such as dioxins and PCBs, mass becomes the overriding concern. Regardless of the overall pollutant concentration at the edge of the mixing zone, the more mass that enters the ecosystem for a persistent or bioaccumulative pollutant, the more available the pollutant to flora and fauna. Over time, as the mass of the pollutant continues to build in the ecosystem, so does the exposure concentration in "hot spot" areas or "sinks", and, throughout the system as a whole, until equilibrium is reached. This condition is especially true for closed systems, such as lakes. Disallowing or decreasing the size of the mixing zone reduces the concentration and mass of the pollutant entering the receiving water from point sources. Over time, reductions in mass lower the equilibrium exposure concentration to flora and fauna and the potential risk to wildlife and human health.

With respect to intake credits, the proposed Guidance contained five different options for addressing intake credits and the Agency invited comment on them. Our initial review of 23,000 pages of information and data from approximately 5,800 respondents indicates that many commenters provided views, facts, and data on the options the Agency outlined in the proposal for intake credits. As part of the final rulemaking process, EPA will pay close attention to those comments and options which reduce the economic impact of the final intake credits policy, while providing increased public health and environmental benefits.

14. With regard to intake credits, it would appear that the lack of provisions in the Guidance allowing intake credits for pre-existing pollutants amounts to regulating facilities for background pollutants that do not originate from facility operations. Does EPA intend to address this issue in the final Guidance? Are the Guidance's provisions with regard to intake credits and mixing zones intended to serve as a model for other regional water bodies of the U.S.?

As noted in the previous question, the proposed Guidance discusses several options for addressing pollutants in intake water, i.e., pre-existing in the background water, that serves as a facility's water supply. Intake credits raise a number of difficult legal, policy, and technical issues that will be addressed in the final Guidance. While these issues are not unique to the Great Lakes Region, EPA must fully evaluate any site-specific considerations present in other waterbodies and mixing zones issues relevant to these waterbodies.

The Clean Water Act requires that NPDES permits contain effluent limitations more

stringent than technology-based limits when necessary to implement State water quality standards. This requirement is not conditioned explicitly on the source of the pollutants in the discharger's effluent. For this reason, EPA, in 1984, declined to apply the intake credit provision crafted for technology-based limits for water quality based limits. At the same time, EPA recognized that developing water quality based permit limits was a complex site-specific endeavor that could account for the presence of intake pollutants on a case-by-case basis as long as the final limit was "adequate to meet the water quality objectives of the CWA when considered along with control requirements for other discharges to the stream." 49 FR 38027 (September 26, 1984).

Intake credits are of particular concern when the background water for a facility contains levels of pollutants that already exceed the water quality standards. The preamble to the proposed Great Lakes Guidance discussed in detail existing mechanisms for adjusting limits for a particular discharger to account for background pollutants when the receiving water exceeds standards: Total Maximum Daily Loads (TMDLs) under Section 303 (d) of the CWA; site-specific modifications to water quality criteria; redesignating uses for a particular waterbody; and temporary variances to water quality standards. TMDLs, which are designed primarily to bring a waterbody that exceeds standards back into compliance by allocating the allowable pollutant loading among the sources of that pollutant, have universal application and may be particularly useful where there are multiple sources of the pollutant of concern. The utility of other mechanisms, which all involve adjustments to standards, will vary depending on the circumstances.

In addition to these mechanisms, EPA, in the Guidance, proposed an additional permit-based provision that would preclude the need for water quality based effluent limits when intake pollutants merely pass through a facility to the same body of water and no other adverse water quality impacts result from the discharge. EPA discussed other permit-based options including: (1) allowing full or partial "intake credit" (direct adjustment to the effluent limits based on pollutants removed from the intake water) where the facility contributed additional amounts of the pollutant in its discharge to the same body of water as the intake pollutants; (2) allowing full or partial "intake credit" where the facility contributed additional amounts of the pollutant in its discharge to a different body of water than the intake pollutants; and (3) an option that includes elements of option (1) and (2). EPA will consider all these options, as well as public comments on these options and others, in developing the final Guidance.

15. Could restricting intake credits prevent industrial expansion of an existing plant or construction of a new plant, even though new facilities meet all Federal discharge criteria? Is the Guidance's intake credit policy cost-effective, and does it consider the degree of risk to humans?

EPA is evaluating all the options discussed in the preamble to the proposed guidance to insure that the final guidance applies the requirements of the Clean Water Act in a manner that equitably regulates discharges of intake water pollutants. It is somewhat difficult to respond to your question about whether the guidance would restrict plant expansion, since all the relevant facts involved in this scenario would have to be considered and it is not clear what is met by "federal discharge criteria". As to your question about cost-effectiveness, the Agency is evaluating the costs that would be associated with various approaches to dealing with intake water pollutants. Finally, one important factor in determining our final approach will be the impact of the final approach on compliance with water quality standards, including those standards that are designed to protect human health.

16. EPA has indicated that facilities will be able to seek variances from the Guidance's intake credit policy if unique conditions at a facility justify the issuance of an intake credit. What type of conditions would allow a facility to receive an intake credit? How flexible will these variance procedures be? How frequently are variances granted under other regulatory mechanisms, such as the National Pollutant Discharge Elimination System?

It is important to recognize that intake credits and "variances", as they presently exist and are discussed in the proposed Guidance, are distinct mechanisms for evaluating whether a particular discharger needs a water quality based effluent limit and to determine what that limit will be. Both are implemented through NPDES permits. Intake credits, which would be a part of the regular process for developing an NPDES permit, are discussed generally in the previous two answers. Because they are part of the water quality standards program, variances are determined by States and are then implemented through NPDES permits. The following discussion addresses water quality standard variances in more detail.

The proposal identified several conditions under which variances from water quality standards may be available to dischargers whose intake water contains pollutants in excess of water quality criteria.

(1) A State could allow a variance under 40 CFR 131.01(g)(1) and proposed procedure 2.C.1 of appendix F of the proposal when "naturally occurring pollutant concentrations prevent the attainment of the use";

(2) 40 CFR 131.10(g)(3) and proposed procedure 2.C.3. of appendix F when "human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place"; or

(3) 40 CFR 131.01(g)(3) and proposed procedure 2.C.6 of appendix F when

"controls more stringent than those required by sections 301(b) and 306 of the CWA would result in substantial and widespread economic and social impact."

EPA is currently evaluating all the comments on the proposal and will decide on the flexibility of the variance provisions and the appropriateness and scope of any mechanism for adjusting water quality-based effluent limits to reflect intake water pollutants.

While variances have not been frequently used to address intake pollutants, under the circumstances above, EPA does believe they are a viable and appropriate mechanism. The final GLI could highlight or promote using variances to address intake pollutants if such a decision is made.

17. Does the Guidance's list of chemicals of concern adjust for forms of compounds that may not be bioaccumulative in the food chain?

The proposal allows adjustment to the list of Bioaccumulative Chemicals of Concern (BCC) for those chemicals that may not bioaccumulate in the food chain. In particular, the proposal states that information on metabolism, molecular size, or other physiochemical properties which might enhance or inhibit bioaccumulation should be considered in adjusting the bioaccumulation factors. For example, EPA did not include 10 pollutants in the proposal that exhibit chemical effects indicative of high bioaccumulation in the laboratory, but which are not likely to meet the definition of a BCC after considering metabolic effects.

18. If the Initiative, with its rather restrictive antidegradation policy, adds chemicals to its list of BCCs on an on-going basis, how can a company obtain permit renewals or expand existing facilities in a cost-effective manner? Will there be a cost-benefit analysis performed before these permit decisions are made?

Under the proposed guidance, it is not envisioned that States, Tribes or EPA will engage in an effort to identify new BCCs solely for the sake of identifying BCCs. However, the proposal does requires States and Tribes to adopt criteria development methodologies for the protection of aquatic life, human health and wildlife. Inherent in criteria development for a pollutant is the calculation of a bioaccumulation factor (BAF). Pollutants with BAFs greater than 1000 will be considered BCCs subject to the implementation procedures contained in the proposal.

Although States and Tribes may develop new water quality criteria and, in so doing, identify new BCCs, an antidegradation review is not required each time a new criterion is developed. Antidegradation review is only required when a discharger proposes to

take an action that would lower water quality in a "high quality" water, usually measured by an increase in the loading of pollutants to a waterbody as a result of its discharge (actions that increase loadings of pollutants of concern into low quality waters or increase the loadings of any pollutants into outstanding national resource waters are not allowable and thus, no antidegradation review is necessary). It is not the intent of the Great Lakes antidegradation policy and procedures to require an antidegradation review every time a facility renews its permit or expands existing facilities. Thus, where there is no change to the discharge, reissuance of the permit will normally occur without an antidegradation review. Therefore, in those instances where a permittee is seeking renewal of a permit and making no process changes, there should ordinarily be no additional costs to the permittee as a result of antidegradation.

In those instances in which a discharger is considering taking an action which would increase its discharge of pollutants to high quality waters, that discharger will be required to undergo an antidegradation review. Under the Great Lakes Water Quality Guidance as currently proposed, an antidegradation review is required for any increase in the discharge of any BCC or any request for a non*deminimis* increase in permit limits for a nonBCC. The antidegradation review would encompass only those pollutants that are present in the discharge and which will increase as a result of the proposed action for which a State/Tribe has criteria at the time that the antidegradation review is required. Subsequent development of new criteria by a State/Tribe will not necessitate an additional antidegradation review.

Federal Regulations at 40 CFR 131.12 require that when a State or Tribe determines that water quality in a high quality water may be lowered, the lowering must be necessary to support important social and economic development. The GLI interprets this as requiring two separate demonstrations that are performed in sequence. First, it must be demonstrated that there are no feasible alternatives that would allow the activity to occur without lowering water quality. The proposal directs the activity's proponent to consider ways in which pollution prevention techniques and/or improved wastewater treatment may be employed to eliminate the need to lower water quality. If the lowering of water quality cannot be avoided through pollution prevention or improved wastewater treatment (within a defined cost range), the permitting authority then must consider how the lowering of water quality will support social and economic development. The GLI identifies social and economic development as an increase in jobs, an increase in personal income or wages, a reduction in unemployment or social service expenses, an increase in tax revenues, or the provision of necessary social services.

19. Could you please explain what your ongoing Great Lakes Toxic Reduction Effort entails? How close are you to completing this effort? Does EPA intend on implementing its Great Lakes Water Quality Guidance before assessing the results of

the Toxic Reduction Effort? Absent the results of this effort, will EPA continue to focus its efforts on regulating point sources?

EPA is working with the States, Tribes, and the public in a multi-media effort with the goal of reducing toxic loadings to the Great Lakes, with an emphasis on BCCs (Great Lakes Toxic Reduction Effort). This effort addresses commitments outlined in the Great Lakes Five-Year Strategy, the Great Lakes Water Quality Agreement, and mandates under the Clean Water Act, the Clean Air Act, and other environmental protection statues.

This new effort proposed to reduce toxic pollutants in the Great Lakes through a three track approach which will be undertaken through ad hoc working groups comprised of Federal, State, and Tribal partners.

Pathway Approach: The first track will identify and address any gaps or barriers in existing regulatory and nonregulatory programs to reduce sources of BCCs or other toxins, with a focus on the five primary non-point source pathways. These pathways include air deposition; sediments; storage, handling, and transport (spills); urban runoff, storm water, combined sewer overflows, and waste sites. Thus, effort will also generate recommendations on ways to use existing authorities to place a priority on BCC reductions.

Virtual Elimination Pilot Project: This project program will select three or four BCCs or other toxic pollutants, including PCBs and mercury, to analyze for the purpose of finding opportunities to achieve virtual elimination of dischargers through source reductions. The full range of sources, both point and non-point, will be identified for each chemical. The analysis will identify and assess existing cost pressures, incentives, and other actions to determine how they contribute to the pace and level of toxic reduction. The analysis will also result in recommended new and modified actions that may help government speed up the pace and level of reductions.

Lake Michigan Enhanced Monitoring Program: The program will develop a sound, scientific base of information to guide toxic load reduction efforts at the State and Federal levels through a "mass balance" effort, similar to the Green Bay Mass Balance study. This program will help determine what specific toxic pollutants are in the lake, where they are coming from, and the relative loadings from atmospheric depositions, tributaries, contaminated sediments, and urban areas.

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In the context of the Clean Water Act Reauthorization, the term "non-point sources" is used primarily to refer to agricultural and urban runoff. There is also a broader meaning to the term. The broader meaning includes all so-called "non-point or diffuse" sources of pollution; not only agricultural and urban runoff, but also air

deposition, sediments, the potential for spills, and leaking waste sites. In the water context, these are often collectively referred to as "non-point" because they are not water point sources, and are not permitted under the NPDES program. It is important to emphasize that we are not beginning with a "clean slate" in addressing air deposition, sediments, spills, urban runoff and CSOs. All are sources of toxics to the Great Lakes, and each has an existing Federal and State regulatory system in place, and a variety of educational, voluntary, data-gathering, enforcement, and other ongoing activities. Therefore, it is confusing to speak of whether EPA will "continue to focus" its efforts on regulating point sources. The collective tools of the EPA and the States in the Great Lakes, be they regulatory or encouraging participation in voluntary reduction actions, are being used simultaneously to address sources of toxic pollution in the Great Lakes.

The Effort is seeking, through a variety of ways, to sharpen EPA and the States' programmatic focus on those toxics that are persistent and that bioaccumulate, and, therefore, pose a unique risk in the Great Lakes. It seeks to achieve better coordination of resources among the air, water, and waste agencies in the Great Lakes Basin. It is an iterative process that will not culminate in a single, overarching, law, rule or guidance, and, therefore, a date for its "completion" cannot accurately be set. A status report at a particular date would be a useful way to monitor progress. We provide a brief status report below.

Each "track" of the Effort is on an independent schedule, driven by the state of the knowledge and current activities. Some products, in the form of policy recommendations, have already been generated Examples include: the proposed changes to the regulation of mercury-containing fluorescent lamps were significantly altered by the Agency after input from Region 5 and the Great Lakes States was received; a coordinated Great Lakes position on the proposed expansion of the Toxic Release Inventory has been developed; the Great Lakes Sediment Task Force is currently drafting comments on EPA's proposed Sediment Quality Criteria; the Great Lakes States and Region 5 have been instrumental in crafting the recommendations contained in the "Great Waters" Report to Congress on Air Deposition of Toxics, set to be released in May. We anticipate a public meeting to discuss the Report and extract an action agenda for the Great Lakes in Fall of 1994.

A symposium on transportation, handling, and short-term storage related spills in the Great Lakes Basin was held in April to focus on how to improve spill prevention, response and remediation and identifying regulatory gaps *and overlaps*. Recommendations as a result of this symposium are expected in June.

The CSO and Urban Runoff Pathway is focusing on ways to encourage toxic pollution prevention in industrial pretreatment programs, and in households and small businesses that are part of CSO systems, as well as data collection issues. Preliminary recommendations are expected in May, 1994.

The Virtual Elimination Pathway has selected PCBs and mercury as its chemicals of initial focus, and descriptive materials about the uses of these chemicals, the regulatory authorities available to control them, and known voluntary actions to reduce them is in development. A workshop is planned in fall of 1994.

The draft workplan for the Lake Michigan Enhanced Monitoring Project is completed and data gathering is beginning.

A final Concept Paper for the Effort, and a more complete status report is anticipated in mid to late summer, and will be provided to the Subcommittee.

20. Does EPA's proposed Guidance adequately fulfill the Great Lakes Water Quality Agreement's call for an "ecosystem approach," given its focus on point sources?

The proposed Great Lakes Water Quality Guidance is but one element in the much broader Great Lakes Program that is being carried out by EPA, the other Federal agencies, and the Great Lakes States and Tribes. The Great Lakes Five Year Strategy, agreed to by Federal and state agencies in 1992, identifies actions to address three primary goals: reducing the releases of toxic pollutants, particularly persistent, bioaccumulative pollutants, to the Great Lakes ecosystem; restoring and protecting important habitat necessary to the survival of endemic species; and protecting the Great Lakes ecosystem's living resources. Actions are underway to move the United States toward achieving these· goals. We believe that the United States is implementing an integrated program for the protection and restoration of the Great Lakes ecosystem. The collective actions of EPA, other Federal agencies and the Great Lakes States are fulfilling the United States' commitments under the Great Lakes Water Quality Agreement, including the Agreement's call for an ecosystem approach to environmental management.

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

MAY 10 1994

The Honorable Solomon P. Ortiz
Chairman, Subcommittee on Oceanography,
Gulf of Mexico, and the Outer Continental Shelf
Committee on Merchant Marine and Fisheries
House of Representatives
Washington, D.C. 20515-6234

Dear Mr. Chairman:

Enclosed are the National Oceanic and Atmospheric Administration's responses to questions received from the Subcommittee as a follow-up to its March 24, 1994, hearing concerning the Great Lakes Basin Ecosystem.

Please do not hesitate to call on me should you require additional information.

Sincerely,

Sally Yozell

Sally Yozell
Director
Congressional Affairs

Enclosure

FOLLOW-UP QUESTIONS FOR DR. ALFRED BEETON BEFORE THE SUBCOMMITTEE ON OCEANOGRAPHY, GULF OF MEXICO, AND THE OUTER CONTINENTAL SHELF COMMITTEE ON MERCHANT MARINE AND FISHERIES HOUSE OF REPRESENTATIVES MARCH 24, 1994

QUESTION 1: Is the Great Lakes Water Quality Guidance what was envisioned when the Great Lakes Initiative began in 1989?

ANSWER: Aside from providing increased scientific understanding of physical, chemical, and biological processes needed to make informed, cost-effective decisions in managing Great Lakes waters, GLERL and NOAA had no responsibility or role in the development of the Great Lakes Water Quality Guidance, within the Great Lakes Initiative (GLI). Consequently GLERL and NOAA have little knowledge/experience in the Guidance development and this question should be directed to the Environmental Protection Agency (EPA) and relevant Great Lakes stakeholders.

QUESTION 2: Are the federal agencies coordinating their activities effectively in the Great Lakes Basin? What steps, if any, could be taken to improve coordination?

ANSWER: With respect to conducting water quality-related research throughout the Great Lakes Basin, communication and coordination among research components is highly-developed. The International Joint Commission's Council of Great Lakes Research Managers (CGLRM) compiles and disseminates an extensive inventory/database of ongoing research activities in both the United States and Canada, and across state and provincial boundaries. The CGLRM also promotes interjurisdictional and multidisciplinary coordination and planning of research related to the implementation of the Great Lakes Water Quality Agreement (GLWQA).

Another important focal point for consolidating and communicating scientific information is the International Association for Great Lakes Research (IAGLR), a professional, non-profit scientific organization composed primarily of U.S. and Canadian researchers and managers. IAGLR, established in 1967, publishes a quarterly Journal of Great Lakes Research and holds annual Great Lakes research conferences.

Within NOAA, there is close linkage and cooperation among GLERL, the Cooperative Institute for Limnology and Ecosystems Research and the Great Lakes Sea Grant University Network.

The strong emphasis placed on the ecosystem approach to examining and solving resource problems in the Great Lakes has led to exceptional levels of coordination among federal research components including the Large Lakes Research Station, Environmental Research Laboratory - Duluth and the Great Lakes National Program Office (EPA), the binational Great Lakes Fishery Commission, the National Biological Survey's Great Lakes Center, the U.S. Fish and Wildlife Service, and the Army Corps of Engineers.

QUESTION 3: Is the Great Lakes Program an appropriate model for other regional bodies of water? What changes might be necessary in implementing a regional program for the Gulf of Mexico?

ANSWER: The Great Lakes Program has been an attempt to get all the stakeholders, i.e., non-governmental organizations, businesses and industry, all levels of government, commissions, and state and federal agencies to recognize and address regional problems. Hence, it is an approach which should benefit any region whether national or international. More specifically, the emphasis has been an ecosystem approach which will help implement ecosystem management, which in turn is integral to sustainable development. Another model for ecosystem management is the ten-year old Chesapeake Bay Program, which has joined three states, the District of Columbia, and numerous Federal agencies in a joint restoration and protection effort by integrating science and management in the formulation of an innovative policy for bay-wide application.

QUESTION 4: Would uniform water quality standards be appropriate for states bordering other regional bodies of water, like the Gulf of Mexico?

ANSWER: Uniform water quality standards may be appropriate if the water bodies are all part of the same uniform ecosystem. Whether this applies to a very large system like the Gulf of Mexico is not absolutely certain because of the diversity of systems. In the Chesapeake Bay region, for instance, standards for the tidal freshwater portions of the estuary may not be appropriate for the more saline waters close to the Bay's mouth. Nevertheless, the ecosystem approach makes sense in determining how best to protect the water body.

QUESTION 5: How well does the overall Great Lakes Program address nonpoint sources of pollution? The Great Lakes Guidance does not directly address nonpoint sources, which, by some estimations, account for as much as 90 percent of all pollutant inputs to the Great Lakes. Do the benefits of the Guidance justify this focus on point sources which are already regulated under the National Pollutant Discharge Elimination System permitting scheme?

QUESTION 8: Should the process used to develop the Great Lakes Water Quality Guidance be used as a model for developing other regional programs?

ANSWER: From the standpoint of institutional organization, much has been learned about benefits and difficulties in implementing an ecosystem approach toward protecting and maintaining water quality. No doubt other regions will differ in institutional composition and interests of stakeholders. These differences will require site-specific plans, policies and actions that best address and mediate the different needs and interests of stakeholders while ensuring the sustained ecological integrity of resources.

QUESTION 9: Will implementation of the Guidance accomplish the goal of significantly improving water quality in the Great Lakes?

ANSWER: The Great Lakes Water Quality Guidance alone will not achieve overall water quality objectives. In concert with other actions such as implementing Remedial Action Plans and Lake-wide Management Plans, the Guidance should significantly improve water quality.

QUESTION 10: Does EPA's proposed Guidance adequately fulfill the Great Lakes Water Quality Agreement's call for an "ecosystem approach," given its focus on point sources?

ANSWER: The Guidance alone would not fulfill the Great Lakes Water Quality Agreement's ecosystem approach. It would be part of the implementation of such an approach. Certainly, Annex 13 of the Agreement would need implementation to address nonpoint source inputs. The Guidance, developed in consultation with Canada, serves as a new organized basis among the U.S. Government and the governments of the eight Great Lakes states to engage Canada more effectively in work on the Great Lakes Water Quality Agreement. This more organized approach by the United States is a major response to the International Joint Commission's long-standing recommendations that the Federal government and Great Lakes states consolidate certain regulatory objectives and work on toxics pollution control to reduce inconsistencies among states and be a more organized partner with both Canadian federal and provincial governments and the IJC.

ANSWER: Nonpoint source pollution is addressed in Annex 13 of the Great Lakes Water Quality Agreement of 1978 as amended by Protocol, November 18, 1987. This annex calls for development and implementation of watershed management plans to reduce non-point source inputs. Implementation of the surveillance, surveys, and demonstration projects as well as the preservation and rehabilitation of wetlands called for in Annex 13 will be essential for dealing with nonpoint source pollution. We continue to have major inputs from point sources and these need to be addressed. As to the relationship/effectiveness of the Guidance relative to the National Pollutant Discharge Elimination System permitting scheme for addressing point sources, I defer to EPA.

QUESTION 6: To what extent have user groups, environmental organizations, industry, and concerned citizens been involved in the Great Lakes Program? With respect to the development of the Great Lakes Water Quality Guidance, how much input did these different groups have? Was it your impression that these different groups generally were satisfied with their level of input and influence?

ANSWER: Historically, the formulation of policy pertaining to protection and management of Great Lakes resources has included a strong element of stakeholder participation. The level of public participation has been particularly high in the formulation of Remedial Action Plans prescribed by the GLWQA to reverse environmental degradation in Areas of Concern. Additionally, public participation has been promoted and supported by Great Lakes United (GLU), a broad-based coalition of 195 U.S. and Canadian groups and organizations representing environmental, labor, tribal, governmental, educational, commercial, and civic interests in the Great Lakes - St. Lawrence River region. GLU organizations are united by a common interest in conservation, proper management, and protection of the Great Lakes - St. Lawrence ecosystem.

QUESTION 7: Did the Great Lakes Initiative do a comprehensive scientific study of the sources, magnitudes, and types of pollution in the waters and sediments of the Great Lakes before developing a list of chemicals of concern?

ANSWER: To my knowledge, the GLI did not explicitly conduct a comprehensive scientific examination of pollutant sources, magnitudes, and types. Instead, it relied on a wealth of published scientific literature, datasets, and expertise in identifying chemicals of concern. Furthermore, a substantial number of pollutants and chemicals of concern have been previously identified and are within the Great Lakes Water Quality Agreement.

Great Lakes Commission

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EXECUTIVE DIRECTOR
MICHAEL J. DONAHUE, Ph.D

July 25, 1994

Representative Solomon P. Ortiz
Chairman
Subcommittee on Oceanography, Gulf of
Mexico and the Outer Continental Shelf
Committee on Merchant Marine and Fisheries
Room 1334, Longworth House Office Building
Washington, D.C. 20515-6230

Dear Representative Ortiz:

Thank you for the opportunity to testify at your hearing of March 24, 1994. Presented below are my responses to the seven additional questions you raised in your letter of March 30. I apologize for the delayed response. Should you have further questions, please contact me and I will respond promptly.

By way of preface, I would like to reiterate my comments during testimony that the term "Great Lakes Program" must be carefully qualified. There is no single, defined "program" that encompasses all Great Lakes-related planning and management activities undertaken in the Basin. Rather, there is a framework—an interconnected web—of individual programs pursued by an array of public agencies. I will refer to the "Great Lakes Program" in the context of that definition.

1) I do believe the collective Great Lakes Program adequately provides for citizen participation. From an institutional/organizational standpoint, non-governmental entities have a strong presence and influence in policy deliberations. I also believe that governments at all levels have, in recent years, made notable efforts to enhance direct citizen participation in their activities. Unquestionably, citizen participation can always be enhanced, but I personally do not view it as a major issue at this time, generally speaking.

   The Great Lakes Commission was not directly involved in the Great Lakes Water Quality Guidance process. Thus, we are not in a position to assess whether all groups were fairly represented.

2) The Great Lakes Commission was not directly involved in the early stages of the Guidance process. Individual state participants may be in a better position to determine whether the Guidance reflects what was envisioned in 1989.

3) The Great Lakes Commission believes that the various federal agencies operating in the Great Lakes Basin do an adequate job in coordinating their efforts. Various mechanisms are in place to ensure such coordination, such as the U.S. Policy Committee staffed by U.S. EPA. Also, the Great Lakes Commission has

established an Observer Program as an adjunct to the activities of its eight state members. Observers include all U.S. federal agencies with Great Lakes-related responsibilities. Those agencies actively participate in a variety of our forums for coordination, policy development and implementation purposes.

This existing institutional infrastructure should be better used to not only expand coordination efforts, but to explore and pursue joint programs, establish research and management priorities; and meet international obligations under the U.S. Canada Great Lakes Water Quality Agreement and related mechanisms.

4) The above response (#3) will also serve as a response to the first question in your item #4. As to the second question, individual states need to be polled, as the Great Lakes Commission was not directly involved in the Guidance development process. The Council of Great Lakes Governors did work directly with the states, and they may have correspondence characterizing individual state views on the Guidance.

5) We have no comment on the accuracy of EPA's estimated costs of implementing the Guidance, as we did not review/critique EPA methodology.

6) Personally, I do believe that the benefits of the Guidance justify its focus on point sources. This was an appropriate point of departure for a very complex and ambitious task. The Guidance compliments and goes beyond the NPDES process and, in so doing, reocognizes in practice the ecosystemic nature of the Great Lakes Basin and the concomitant need for consistency among multiple political jurisdictions.

Non-point source pollution is, indeed, a significant problem also, and could benefit from an added degree of consistency between and among the Great Lakes states. Efforts are underway to develop a "second round" of the Guidance process that will focus on such sources. Given the fundamental differences in point and non-point source pollution characteristics and control requirements, it is appropriate to address these matters on separate yet coordinated tracks.

7) EPA's proposed Guidance is an important first step in fulfilling the Great Lakes Water Quality Agreement's call for an "ecosystem approach". It does not, in and of itself, satisfy the Agreement in its entirety, but it lays a strong foundation on which to build. The attached excerpt from the most recent report of the International Joint Commission's Science Advisory Board will be of interest. I serve as U.S. Co-Chair of the Board and believe that this statement summarizes my views on this matter.

Thank you for the opportunity to share my perspectives.

Sincerely,

Michael J. Donahue

Michael J. Donahue, Ph.D
Executive Director

MJD/rjs

2.1.2 Recommendations

It is recommended that:

- the Commission urge the Parties to implement the 1980 Toxic Substances Committee recommendations (IJC 1981)
- the Commission urge the Parties to confirm whether resources are being used effectively to reduce loadings of toxic substances
- the Commission promote the establishment by the Parties of a compatible toxic substances loadings database, possibly using Geographic Information System technology
- the Commission urge the Parties to establish a binational workgroup to develop a Great Lakes toxics reduction strategy that would include timetables, specific load reduction targets and phase-out plans
- the Commission recommend that the Parties submit a biennial assessment of their progress toward achieving loading reduction targets for toxic chemicals.

2.2 Binational Consistency of the Great Lakes Water Quality Initiative and the Great Lakes Water Quality Agreement

In the Great Lakes Critical Programs Act of 1990, Congress directed the U.S. Environmental Protection Agency (U.S. EPA) to propose and publish water quality guidance for the Great Lakes. Titled the Great Lakes Water Quality Initiative (GLI), the proposed guidance establishes minimum water quality criteria, anti-degradation policies and implementation procedures for waters within the jurisdiction of the eight Great Lakes states as well as Indian tribes. The procedures are to be used to establish consistent water quality goals and in so doing, better control discharges from industries and municipalities within these waters.

The GLI seeks to address two recognized weaknesses of existing U.S. programs through the development of a regional program. First, existing programs do not adequately take into account the adverse effects of persistent toxic chemicals. Second, the GLI addresses the consistency problem around Great Lakes jurisdictions with respect to the development and implementation of water quality programs. Six related procedures are associated with the GLI:

- deriving criteria to protect aquatic life
- deriving criteria to protect human health
- deriving criteria to protect wildlife
- using bioaccumulation factors in calculating criteria
- protecting current water quality (antidegradation)
- expressing standards as regulatory commitments to facilitate implementation

The genesis of the GLI occurred in the late 1980s, when Great Lakes states requested U.S. EPA to ensure consistency in procedures for permitting discharges under their National Pollutant Discharge Elimination System (NPDES) programs. Over the last several years a steering committee, a technical workgroup and a public participation group have provided the structure for GLI development, collectively involving U.S. federal and state agencies, tribal authorities, municipalities, environmental groups and academia, and an observer role for Canadian government representatives.

Once the GLI guidance is incorporated into law, states and Indian tribes will be required to implement its provisions within two years or responsibility will revert to the U.S. EPA. The GLI guidance, under the terms of its development, is to conform with the Great Lakes Water Quality Agreement of 1987 and be no less restrictive than current national policy and guidance established by U.S. EPA.

2.2.1 Science Advisory Board Review

The Commission's Science Advisory Board (Board or SAB), through its Workgroup on Parties Implementation, recognized that implementation of the GLI would substantively affect U.S. water quality programs and have implications for U.S. and Canadian commitments under the terms of the GLWQA. It was therefore suggested that the GLI be examined with respect to its consistency with the GLWQA. Such an endeavour was intended to highlight and address relevant questions and issues and, in so doing, move forward the cooperative, binational approach to the Great Lakes water quality protection. The express intent of the inquiry was to examine issues of consistency and GLWQA implications; no effort was made to evaluate the GLI or generate findings on its adequacy. This approach was accepted by the Commission in early 1993 and an assessment was subsequently undertaken on behalf of the Science Advisory Board by the workgroup.

Several key items from this investigation warrant presentation. The Science Advisory Board found that:

- If fully implemented, the GLI will lead to a reduction in persistent toxic chemicals entering the Great Lakes.
- If fully implemented, the GLI will move the U.S. Federal Government and Great Lakes states closer to a goal of virtual elimination as outlined in the GLWQA. In and of itself, however, the GLI will not fully achieve that goal and will need to be augmented by subsequent related initiatives.
- The GLI is not intended to address nonpoint sources of pollution, pollution prevention, or elimination of point source discharges of persistent toxic substances. Sunsetting chemicals also is not explicitly addressed. The SAB recognizes the Great Lakes Toxics Reduction Initiative (GLTxRI) as a potentially effective vehicle in this regard, as it may address nonpoint sources (e.g. airborne pollutants, urban runoff, groundwater discharge) as well as sunsetting certain toxic chemicals. The GLTxRI is presently in its formative stages as an adjunct to the GLI.
- A comparison of GLI criteria/values with GLWQA ambient water quality objectives reveals some variances (Table 2.3)

Specific water quality objectives proposed in the GLI are called either "criteria," if they are determined via the "Tier 1" methodology (data considered sufficient); or "values," if they are determined using "Tier 2" methodology (data considered insufficient). The GLI proposal includes criteria or values for 35 different chemicals. For 19, there are also GLWQA numeric water quality objectives for ambient water.

The GLI proposal includes procedures that will allow calculation of Tier 2 values for any chemical for which the minimum database exists (as little as one acute toxicity test with a daphnid species). The U.S. EPA completed Tier 2 calculations for a few chemicals (see notations on Table 2.3 and Figure 2.2) but it is possible to calculate Tier 2 values for literally hundreds more. Thus, the criteria/values published for the 35 chemicals in the GLI proposal should be viewed as an initial effort with many more to follow.

Table 2.3 and Figure 2.2 present a comparison of the proposed GLI numeric criteria and values as proposed in the Federal Register of April 16, 1993, and the numeric water quality objectives as presented in Annex I of the Great Lakes Water Quality Agreement of 1978, as amended by Protocol on November 18, 1987. All figures shown are for concentrations in ambient waters. Only the most stringent (i.e. lowest) criteria from the GLI are shown in the table. For example, the chronic aquatic criterion for Lindane is 0.7 µg/L and the human cancer value (Tier 2) is 0.02 µg/L. GLI criteria/values for metals are based on ambient water hardness of 50 ppm.

TABLE 2.3 Comparison of proposed Great Lakes Initiative criteria/values and Great Lakes Water Quality Agreement ambient water quality objectives (in µg/L)

Chemical	GLI	GLWQA	Ratio of GLI to GLWQA	Notes
Aldrin	0.018	0.001	18.0	1, 5, 8
Arsenic III	150.0	50.0	3.0	2, 5
Cadmium	0.78	0.20	3.9	5
Chlordane	0.0002	0.060	0.0033	7, 8
Chromium-III	49.0	50.0	0.98	2, 5
Chromium VI	11.0	50.0	0.22	2, 5
Copper	5.2	5.0	1.04	5
DDT	0.00000087	0.003	0.00029	3, 6
Dieldrin	0.0001	0.001	0.10	1, 7
Endrin	0.037	0.002	18.5	5
Heptachlor	0.0005	0.001	0.5	4, 7
Lead	8.3	10.0	0.83	5, 8
Lindane	0.02	0.01	2.0	7, 8
Mercury	0.00018	0.2	0.0009	6
Nickel	29.0	25.0	1.16	5
Parathion	0.013	0.008	1.63	5
Selenium	5.0	10.0	0.50	5
Toxaphene	0.00002	0.008	0.0025	7
Zinc	60.0	30.0	2.0	5

NOTES:
1. The GLWQA specifies dieldrin plus aldrin
2. The GLWQA specifies only total of species
3. The GLWQA includes DDT metabolites
4. The GLWQA includes heptachlor epoxide
5. GLI criterion based on chronic aquatic effects
6. GLI criterion based on wildlife effects
7. GLI criterion based on human health effects (cancer)
8. GLI number computed using Tier 2 methodology

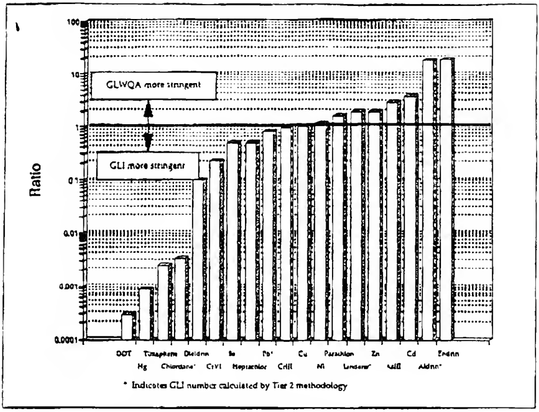

FIGURE 2.2 Ratio of proposed Great Lakes Water Quality Initiative criteria/values to Great Lakes Water Quality Agreement water quality objectives

While such a comparison between the GLI and the GLWQA must be qualified given differences in approaches to calculations (see Table 2.3 notes), it is useful in understanding the level of consistency between the two initiatives.

Nine of the GLWQA objectives are more stringent than the proposed GLI criteria/values: two, by just over an order-of-magnitude. Ten of the proposed GLI criteria/values are more stringent than the GLWQA objectives: one, by an order-of-magnitude; two, by two orders-of-magnitude; and two, by three orders-of-magnitude.

None of the chemicals have identical numbers, though nine are within 100 percent of each other. Among the ten others, differences of up to three orders-of-magnitude are found (see Figure 2.2). There is a tendency for the differences to be largest when the GLI is more stringent than the GLWQA.

Water quality criteria have been developed under the GLI for two substances for which no comparable water quality objectives have been included in the GLWQA. These substances are PCB and 2,3,7,8-tetrachlorodibenzo-p-dioxin. Water quality objectives for these two substances were, however, developed and proposed to the International Joint Commission but were not incorporated into the Agreement. PCB and dioxin have been inferred to be the two substances that have caused damage to fish and wildlife populations in the Great Lakes basin (Gilbertson et al. 1991; U.S. EPA 1993). A comparison of the numbers derived for PCB and dioxin through the two different processes is therefore warranted.

The value for PCB published in Appendix A to the 1974 Water Quality Board report was 1 ng/L. This value was designed to protect aquatic biota as well as consumers of aquatic life by recommending tissue levels in fish below 0.1 µg/g and utilizing a bioconcentration factor of 10^5. The value for 2,3,7,8-TCDD recommended by the IJC was 0.01 ng/L which was based on the limit of analytical detection at that time (IJC 1974; 1980).

The comparable values for PCB and dioxin under the GLI are 0.0017 ng/L and 0.0000096 ng/L, respectively, for protection of wildlife. Thus, the ratio of the criteria derived for the Initiative versus those developed through the IJC are 0.017 for PCB and 0.00096 for dioxin.

2.2.2 Conclusions

The Science Advisory Board recognizes the GLI as a positive step in encouraging greater consistency among water quality programs of Great Lakes states. The Board also believes that the Great Lakes Basin Ecosystem is best served by a consistent, coordinated approach at the binational level as well as an approach that recognizes the GLWQA as the primary vehicle by which the two Parties formulate and pursue shared objectives, relying upon their own regulatory approaches such as the GLI. Within this context, the Science Advisory Board's analysis of binational implications yields two conclusions:

- First, the GLI has strong binational implications in regard to the implementation and future renegotiation of the GLWQA. The introductory sections of the GLI, for example, indicate the intention of the U.S. Government to submit the GLI as a basis to revise the GLWQA objectives. However, GLI development proceeded largely outside the binational arena. This matter should be addressed, as several questions from the SAB review remain unresolved. For example, some GLI criteria are more stringent than the GLWQA objectives, others are less. What are the implications for the latter? How will the GLI affect the negotiation of water quality objectives under the GLWQA? In instances where these criteria conflict with the GLWQA goals, or where the scientific basis of the objectives differ, how will binational commitments to the GLWQA be affected? If the GLI moves forward, the SAB believes that such issues should be explicitly addressed in a binational forum under IJC auspices to ensure shared efforts in addressing GLWQA goals.

- Second, the SAB believes that the institutional capacity under the Agreement to facilitate binational processes in water quality protection must be enhanced. Prior to 1991, the Water Quality Board (WQB) was mandated to evaluate the Parties' progress by assessing the adequacy of policies and programs enacted to implement the Great Lakes Water Quality Agreement. Its mandate has since been revised to that of a policy advisor. However, the interests of the Parties (and the larger Great Lakes community) with regard to the GLI may well have been better served by the pre-1991 WQB mandate. Under that scenario, a formal mechanism for examining and addressing the binational implications of the GLI would have been operational within the IJC, and current uncertainties about the GLI relative to the GLWQA would have been addressed. The SAB believes that a return to the pre-1991 WQB mandate to binationally assess the Parties' toxics reduction initiatives will enhance the binational support for both U.S. and Canadian initiatives (such as the GLI) to contribute to overall ecosystem health.

2.2.3 Recommendation

It is recommended that

- **the Commission urge the Parties to strengthen and formalize their binational approach in water quality objective-setting to ensure that the Great Lakes Water Quality Initiative and related future U.S. and Canadian initiatives are pursued in a binational forum consistent with Great Lakes Water Quality Agreement goals**

GREAT LAKES
WATER QUALITY
COALITION

May 2, 1994

The Honorable Solomon P. Ortiz,
Chairman
Subcommittee on Oceanography, Gulf of Mexico
and the Outer Continental Shelf
U.S. House of Representatives
575 Ford House Office Building
Washington, D.C. 20515

Dear Chairman Ortiz:

On behalf of the Great Lakes Water Quality Coalition, I am pleased to respond to the questions that you sent me following the hearing last month before the Subcommittee on Oceanography, Gulf of Mexico and the Outer Continental Shelf regarding the Great Lakes Initiative (GLI) and the Gulf of Mexico program (GOMP). I agree that the lessons learned from the U.S. Environmental Protection Agency's (EPA) development and proposal of the GLI can be of significant value in consideration of the development of the GOMP. The questions and my answers are as follows.

1) Do you think that the Great Lakes program adequately provides for participation by the citizens and users of the Great Lakes region? Were all groups fairly represented throughout the process used to develop the Great Lakes Water Quality Guidance?

Response: In response to concerns expressed over stakeholder participation in the GLI development process, EPA acknowledged well after proposal development had begun that affected parties should be involved. EPA formed three committees: the Steering Committee, comprised of representatives from EPA Headquarters, EPA Region V, and the water quality directors from the Great Lakes States; the Technical Work Group, consisting of technical staff from relevant Federal and State agencies; and, the Public Participation Group which included representatives from industry, environmental groups, municipalities, and academia. On paper, this arrangement provided an avenue for excellent input and participation. Unfortunately, the Public Participation Group's opportunities to provide significant input into the development of the Guidance were severely limited. By the time the Group was given the background information and opportunity to enter the discussions, many of the critical decisions had been made. The co-chairs of the Group were allowed to step to a mike and periodically address the Steering Committee briefly, from the floor. However, their recommendations were often not given meaningful consideration and response by the Agency, which cited time constraints as the reason for not making changes.

The result has been the proposal of an initiative as a regulation which contains complex scientific concepts which

even the Agency's own Science Advisory Board says are not ready for application. The existing Gulf of Mexico program is structured to avoid this outcome, given its focus on science. It must remain that way.

2) Do uniform water quality standards remove market-driven incentives to move facilities to states with less stringent standards? To your knowledge, do any such incentives currently exist with regard to the Gulf of Mexico region?

Response: Water quality standards are just one of a long list of factors and conditions that a company considers in locating or expanding. The cost of relocating a facility is substantial. The compliance costs with one state's water quality standards versus another's should vary somewhat to account for site specific needs. Uniform water quality standards in the Great Lakes probably will not "level the playing field" as some politicians in the mid-80s intended, either within the Great Lakes region, or on a national or international basis. Eliminating any site-specific flexibility, as has been proposed, when coupled with tough generic standards applicable in all situations, will put the Great Lakes at a competitive disadvantage with other regions, nationwide and internationally.

3) To what extent will industrial facilities have to alter their manufacturing processes to comply with the requirements of the Great Lakes Water Quality Guidance? Has EPA correctly estimated the costs of compliance with these regulations, or do you foresee expenses above and beyond those predicted by EPA?

Response: Manufacturing facilities will utilize all means of compliance with the final rule. These will include control at the source, recycling, reuse, improved practices and procedures, and end-of-pipe controls. In spite of this, compliance costs are likely to run into billions of dollars per year - many times greater than EPA's upper-bound estimate of $500 million. The inaccuracy of EPA's cost figures has been confirmed by the Coalition through review of engineering analyses used to arrive at the figures for a number of Coalition members' facilities. Attached for your review is that documentation - Appendix A "Deficiencies in EPA's Cost Analysis" for three facilities. This was included in the Comments of the Great Lakes Water Quality Coalition on the Proposed Water Quality Guidance for the Great Lakes System. As the analyses illustrate, there is a great deal of EPA oversight of the measures and facilities that would need to be put in place. They have presumed that source reduction programs can be implemented at no cost. They cannot. For example, the pulp and paper industry has invested over one billion dollars in process control technology to virtually eliminate dioxin discharges.

In addition, the Chemical Manufacturers Association, in its September 13, 1993 comments to EPA on the proposed Guidance (Section IX. Compliance Costs) cited the principal reasons underlying EPA's underestimation of compliance costs as follows:

o The failure to consider compliance costs of achieving the proposed elimination of mixing zones for bioaccumulative chemicals of concern (BCCs).

o The failure to adequately consider the compliance costs associated with Tier II values or the costs of developing Tier I criteria to supplant these values.

o The assumption that non-contact, once-through cooling waters would be excluded from regulation as a result of the proposed provisions for accounting for background concentrations.

o The assumption that relatively inexpensive pollution prevention measures can be used by all indirect and direct industrial dischargers to achieve compliance with standards for ubiquitous pollutants, such as mercury and PCBs, which are found in precipitation and receiving waters at concentrations above the proposed criteria.

o The assumption that when an effluent achieves the existing analytical detection limits, a discharger has complied with the Guidance, when in fact, the regulations require that the discharger ultimately remove the subject pollutant to below detection levels in all internal waste streams.

o The assumption that most minor dischargers will not be affected by the Guidance when in fact the presence of such substances as mercury and PCBs in precipitation means that virtually every point source discharge will be affected.

o The assumption that analytical detection levels will not improve with time, which underestimates compliance costs because it assumes that there will be a constant compliance target for each pollutant.

EPA underestimated costs relative to publicly owned treatment works (POTWs) as well. They do face increased costs for pollution prevention and treatment. Additionally, their administrative costs will increase astronomically. A September 1993 engineering study conducted at Gary, Indiana Sanitary District, using it as a model facility, concluded that preparation and issuance of a NPDES Permit following provisions of the proposed rule will be costly, labor intensive and time consuming. The total cost to the Gary POTW (or similar industrial or municipal discharger) and the regulatory agency to prepare the permit will be approximately $3,000,000. The estimated time needed to prepare and issue a single permit is 4 years. A copy of the study report prepared by Rust Environment and & Infrastructure is enclosed, for your information.

4) Is the Great Lakes Guidance what was envisioned when the Great Lakes initiative process commenced in 1989?

Response: In June 1989, due primarily to the impetus provided by the U.S.-Canada Great Lakes Water Quality Agreement and the Great

Lakes Governors' Great Lakes Toxic Substances Control Agreement, EPA's Region V office began to coordinate the development of the Guidance. The goal was for EPA and the States to work together to promote more consistent water quality regulatory programs within the Great Lakes basin. The new approaches developed could then be used as a basis for revision of water quality standards during the next triennial review period provided by the Clean Water Act, and to negotiate revisions to the objectives contained in the U.S.-Canada Agreement. Unfortunately, the current proposal has grown far beyond those modest objectives.

The proposal was envisioned to be "guidance" when the process was initiated in 1989. The Council of Great Lakes Governors had a dialogue with Val Adamkus, Administrator of EPA Region V, at their August 9, 1993 meeting in Duluth, Minnesota, during which they realized that EPA had interpreted the Great Lakes Critical Programs Act to require that the Guidance become regulation. The Governors directed the staff to develop a joint statement reflecting concern for EPA's interpretation that rules, not guidance, must be issued. This appears in the September 13, 1993 submittal of a joint statement of the Council of Great Lakes Governors on the Great Lakes Water Quality Guidance to U.S. EPA. under the section: The Intent of the Critical Programs Act to Create a Regional "Guidance" Must be Preserved. In summary, the Governors stated: "The final Guidance should recognize that consistency requires harmonious adoption of key provisions which establishes regulatory equivalence, not verbatim adoption which stifles innovation, creativity and due process." In addition, the Subcommittee may find useful the attached joint statement containing the Governors' recommendations for modifications in the proposed guidance, which reveals their lack of total support for the proposal as it stands.

Further, it would be worthwhile for the Subcommittee to consider actual statements made by individual states regarding the proposed Guidance, in terms of conditions of their support. Three Great Lakes States governors have written letters recently, reiterating the need for the Guidance to become more cost-effective and for substantial improvement in it. For your information, enclosed are letters: from Governor Cuomo of New York to EPA Administrator Browner (dated April 26, 1994); from Governor Thompson of Wisconsin to Representative Petri of Wisconsin (dated 3/14/94); and, from Governor Voinovich of Ohio to Representative Applegate of Ohio (dated 4/5/94).

Also, the question of Canadian support for the proposed Guidance was raised at the Subcommittee hearing. You should be aware that Canada, which ostensibly has the same obligations as the U.S. under the Great Lakes Water Quality Agreement, has not proposed, and is apparently not considering implementing a program comparable to EPA's proposed Guidance.

Even the International Joint Commission's (United States and Canada) Great Lakes Science Advisory Board in its 1993 Report raises some questions, including:

"The introductory sections of the GLI, for example, indicate the intention of the U.S. Government to submit the GLI as a basis to revise the Great Lakes Water Quality Agreement objectives. However, GLI development proceeded largely outside the binational arena... It is recommended that: the Commission urge the Parties to strengthen and formalize their binational approach in water quality objective-setting to ensure that the Great Lakes Water Quality Initiative and related future U.S. and Canadian initiatives are pursued in a binational forum consistent with Great Lakes Water Quality Agreement goals."

Finally, as witnesses at the hearing before your Subcommittee remarked, water quality in the Great Lakes definitely has improved over the past couple decades. The report that I submitted at the hearing for the record, entitled "Great Lakes Environmental Assessment" concluded that toxic chemicals, the focus of EPA's regulatory proposals for the Great Lakes basin, are of secondary importance to the health of the ecosystem. It found that the severe decline of Great Lakes physical habitat and the massive introduction and continued expansion of exotic (non-indigenous) species represent the greatest threats to the Great Lakes ecosystem. The report was prepared by LTI-Limno Tech, Inc of Ann Arbor, Michigan, with Dr. Paul Rodgers of LTI and Dr. Thomas Heidtke cf Wayne State University as the principal investigators. Information was gathered through extensive review of the published and "gray" literature and from written and other input from a panel of nineteen expert Great Lakes researchers.

Despite this assessment, the proposed rule would require the expenditure of as much as $2.3 billion per year for attempts to control trace amounts of pollutants from point sources (industrial and municipal wastewater treatment facilities) only. This is the estimate of the independent study conducted by DRI/McGraw-Hill for the Council of Great Lakes Governors last summer (copy enclosed). The DRI report stated: If the public and their non-technical policy makers believe that by supporting GLI they will solve "half the problem" in the Great Lakes, they will be deceived. Toxic substances covered in the GLI are only one of many classes of problems facing the lakes, and point source contributions of even those substances represent far less than half of the total loadings.

Thank you for the opportunity to provide you with these observations and materials. In addition to my activities relating to the development of the GLI proposal, I also participate in industry groups working to contribute to the GOMP efforts. These stakeholder groups are committed to making a positive impact on the success of the GOMP, and look forward to assisting your Subcommittee as you continue your deliberations.

Sincerely,

Dale K. Phenicie

Dale K. Phenicie
Environmental Policy Task Group Chair

Amoco Oil Company
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Whiting, Indiana 46394-0710
219-473-7700

T T Scruggs
Refinery Manager

April 27, 1994

The Honorable Solomon P. Ortiz, Chair
Subcommittee on Oceanography, Gulf of Mexico,
and the Outer Continental Shelf
Longworth House Office Building, Room 1334
Washington, DC 20515-6230

Dear Mr. Chairman:

I would like to again thank you and your subcommittee for allowing me the opportunity to share with you our concerns with the Great Lakes Initiative.

Amoco is interested in ensuring a fair and workable Great Lakes Initiative that will protect and preserve the Great Lakes. However, we strongly believe that regulations should be based upon sound science and risk-based controls that truly achieve environmental protection without challenging the economic health of the region. As currently written, the Great Lakes Initiative, because of its very narrow focus on point sources, will achieve very little pollutant reductions while imposing tremendous compliance costs on industry, municipalities and ultimately, the taxpayer.

Pursuant to your letter of March 30, 1994, I am attaching our answers to the questions requested by your subcommittee members. Should you or any committee member have any questions on the Great Lakes Initiative or the Gulf of Mexico, please feel free to call upon me or my technical experts.

Sincerely,

T. T. Scruggs
Refinery Manager

Attachment

PANEL TWO

RESPONSES TO QUESTIONS FOR MR. SCRUGGS

1) Do you think that the Great Lakes Program adequately provides for participation by the citizens and users in the Great Lakes region? Were all groups fairly represented throughout the process used to develop the Great Lakes Water Quality Guidance?

The Public Participation Group (PPG), comprised of limited representation from the environmental community, industry and municipalities, was the mechanism through which citizens and users participated in the development of the Guidance. The purpose of the PPG was to observe the activities of the two groups responsible for drafting the Guidance, the Steering Committee and the Technical Work Group, and to make recommendations on behalf of the public's concerns.

The PPG, however, was not an integral part of the process. The process did not assure real participation. Although concerns could be expressed, it was never clear that action would be taken to address the concerns. The process lost credibility when ideas, questions and recommendations were not addressed in the draft proposals.

Further, representation on the PPG narrowly focused on point source dischargers. Adequate representation from other interests such as small businesses, municipalities and agricultural concerns was missing.

Amoco would recommend broader participation of all stakeholders in the region; stakeholders must feel they have an ownership in the process and a true voice in determining the outcome.

2) Do uniform water quality standards remove market-driven incentives to move facilities to states with less stringent standards? Did any such incentives exist in the Great Lakes region? To your knowledge, do any such incentives currently exist with regard to the Gulf of Mexico region?

Uniform water quality standards do not remove market-driven incentives to relocate facilities to states with less stringent standards; rather, it is overly restrictive water quality standards and implementation procedures that are neither scientifically sound nor cost-effective which create an incentive for industries to relocate to other states. The GLI has the potential to create such an incentive; the Gulf of Mexico region could follow if patterned after the GLI.

Logically, there is no reason why a facility would choose to operate in a state which requires environmental controls that result in little, if any, environmental benefit. To do so would potentially place it at a competitive disadvantage with similar facilities in other states or regions. States should also have the flexibility to address local and site-specific conditions so that cost-effective controls can be implemented which gain the most environmental improvement. If a state or region does not provide these basic requirements for doing business and allow for protection of the environment in a cost-effective manner, it makes little sense for the industry to remain in the area.

3) To what extent will industrial facilities have to alter their manufacturing processes to comply with the requirements of the Great Lakes Water Quality Guidance? Has EPA correctly estimated the costs of compliance with these regulations, or do you foresee expenses above and beyond those predicted by EPA?

Facilities may have to signficantly alter their manufacturing processes to comply with the requirements of the GLI. Lack of intake credits, mixing zone restrictions and a mandated pollutant minimization program (PMP) upstream of the wastewater treatment plant will require manufacturing processes to be modified with very little environmental benefit in return.

For example, if intake credits are not allowed, the Whiting refinery will be forced to either treat the 120 million gallons per day of non-contact cooling water to levels cleaner than intake quality or install cooling towers. Either option will cost over $140 million. Arbitrary mixing zone restrictions for non-bioaccumulative chemicals of concern will require the installation of over $50 million in additional treatment, even though such controls may be unwarranted and scientifically unjustified to protect aquatic life and the environment. Requiring dischargers to implement a PMP upstream of the wastewater treatment plant for pollutants with effluent limits below the level of detection is inefficient, results in redundant treatment and is scientifically unjustified. For example, in the refining industry, metals are present in crude oil. Any process modification will have no impact on controlling the level of metals in a refinery's wastewater. Further, available treatment technologies dictate that metals must be removed after most other pollutants have been treated; therefore, requiring treatment upstream of the wastewater treatment plant is infeasible and would not contribute to the control of pollutants.

EPA estimated the overall annual GLI compliance cost for the region at $80 to $510 million. However, this figure significantly underestimates treatment costs and fails to include the cost of not providing intake credits. As mentioned above, if intake credits are not allowed, the capital cost to either treat the non-contact cooling water or install cooling towers is $140 million at the Whiting refinery alone. The McGraw/Hill DRI Study commissioned by the Great Lakes Governors estimated direct, annual compliance costs of the GLI between $710 million and $2.3 billion versus EPA's estimate of $80 to $510 million annually.

4) Is the Great Lakes Guidance what was envisioned when the Great Lakes Initiative process commenced in 1989?

No, the Guidance is not what was envisioned when the GLI process commenced in 1989. The GLI was to be a partnership between states in the region. Its goal was to improve the water quality of the Great Lakes by addressing all sources of pollutants and to avoid unfairly burdening any one sector within the region. However, the result of the GLI is a guidance package which only addresses point sources of pollutants, even though non-point sources have been found to contribute over 90% of the pollutant load to the Great Lakes. The GLI will require point source dischargers to invest millions of dollars in additional treatment and process modifications which will result in very little environmental improvement in the Great Lakes region. Even after the GLI is implemented, significant water quality problems will remain.

5) Does EPA's proposed Guidance adequately fulfill the Great Lakes Water Quality Agreement's call for an "ecosystem approach," given its focus on point sources?

The GLI does not adequately fulfill the Great Lakes Water Quality Agreement's call for an "ecosystem approach." A true ecosystem approach would consider all sources and fates of pollutants within the Great Lakes basin. The GLI, however, only addresses industrial and municipal point sources which account for a very small percentage of toxic loadings to the Great Lakes. Non-point sources such as air deposition, urban and agricultural run-off, and contaminated sediments are ignored. Amoco strongly urges EPA to first evaluate the contribution of all pollutant sources to the Great Lakes, and then prioritize control measures based on their environmental benefits and cost-effectiveness. Only by first completing this multi-media or ecosystem assessment and implementing corresponding controls will the GLI result in measurable environmental improvement.

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April 29, 1994

Solomon P. Ortiz, Chairman
Subcommittee on Oceanography,
Gulf of Mexico and the
Outer Continental Shelf
U.S. House of Representatives
1334 Longworth House Office Building
Washington, DC 20515

Dear Representative Ortiz:

Thank you for your letter of March 30. I am responding below to questions in the letter which follow up on my March 24 testimony before your Subcommittee.

1. Do you think that the Great Lakes Program adequately provides for participation by citizens and users in the Great Lakes region? Were all groups fairly represented throughout the process used to develop the Great Lakes Water Quality Guidance?

As I pointed out verbally to the Committee, EPA is to be credited for a good try at involving the public in rulemaking involving complicated and technical issues of the Great Lakes Water Quality Guidance. We support their efforts at outreach. However, the Agency could have improved their work to secure the participation of low-income communities, both urban and rural. This observation also applies to the work of Great Lakes National Program Office, in general.

2. Is the Great Lakes Guidance what was envisioned when the Great Lakes Initiative process commenced in 1989?

In 1989, Sierra Club had the broad vision that the Great Lakes Initiative would help the United States comply with our nation's obligations under the Great Lakes Water Quality Agreement with Canada. Specifically, we wanted to see the federal and state governments work together to comply with the Agreement's goal of zero discharge of persistent toxic chemicals. The current proposed Guidance is a significant step in that direction.

3. Do the benefits of the Great Lakes Water Quality Guidance justify its focus on point sources, despite the fact that nonpoint sources account for a large percentage of pollutant inputs to the Great Lakes, and despite the fact that point sources are already regulated under the National Pollutant Discharge Elimination System?

Chairman Solomon P. Ortiz, April 29, 1994
page 2

Point sources are already regulated under the National Pollution Elimination Discharge Elimination System. However, despite its name, this System has failed to eliminate discharges of persistent toxic chemicals, as called for in the Great Lakes Water Quality Agreement. Citing page 7 of my March 24 testimony: --U.S. Great Lakes polluters were legally permitted to dump 7.3 million gallons of oil, 89,000 pounds of lead, 1935 pounds of PCBs, and 933 pounds into the Lakes in 1990. This NPDES-permitted dumping of oil into the drinking water source for 20 million people amounts to two-thirds of what was spilled by the Exxon Valdez. Lead, PCBs, and mercury are extremely toxic, persistent, bioaccumulative chemicals, discharge of which must be phased out to zero. Thus, any and all movement towards zero discharge of persistent toxic chemicals through tightening the NPDES permits is justified. Sierra Club also believes EPA should move expeditiously towards reducing to zero the pollution of the Great Lakes by persistent toxic chemicals coming into the ecosystem from runoff, airborne deposition and other pathways. See my march 24 testimony for details.

4. Does EPA's proposed Guidance adequately fulfill the Great Lakes Water Quality Agreement's call for an "ecosystem approach," given its focus on point sources.

EPA has said that the proposed Guidance is only the first phase of rulemaking. As noted in my previous response, the tightening of NPDES permits would have to take place in order to meet this nation's obligations under the Great Lakes Water Quality Agreement. Therefore, EPA's management decision, coupled with a commitment to initiate a second phase of rulemaking, adequately meets the call for an "ecosystem approach" for management. Whether the content of the Guidance constitutes an ecosystem approach will be seen when the all of the promulgated rules are published.

Thank you for the opportunity to comment on these matters.

Sincerely,

George Coling

George Coling
Great Lakes Washington Specialist

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WATER QUALITY

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Excerpt From Comments Of

THE GREAT LAKES WATER QUALITY COALITION

Submitted to U.S. EPA

On The Proposed

GREAT LAKES WATER QUALITY GUIDANCE

September 13, 1993

APPENDIX A

DEFICIENCIES IN EPA'S COST ANALYSIS

EPA has estimated that the proposed Great Lakes Guidance would result in compliance costs of $80-$500 million per year. That estimate is based primarily on a report prepared for EPA by its consultant, Science Applications International Corporation ("SAIC"). The SAIC report evaluated the impact of the Guidance on each of 59 direct dischargers in the region, and EPA extrapolated from that plant-specific information in order to arrive at its region-wide cost estimates.

The validity of EPA's cost estimates depends upon whether the SAIC cost estimates are reasonably accurate. In order to assess the accuracy of the SAIC analysis, the Coalition reviewed several of the plant-specific cost evaluations performed by SAIC that concerned facilities owned and operated by Coalition members. Based upon its review, which is summarized below, the Coalition has concluded that SAIC's cost analysis substantially underestimates facility compliance costs. In some cases, actual compliance costs are likely to be 10, 20, or even 100 times higher than the costs predicted by SAIC. As a result, the EPA cost estimates that are predicted on the SAIC report are invalid; the Coalition's analysis indicates that the true annual compliance costs are likely to be far higher than the $80-$500 million range predicted by the Agency.

I. <u>DuPont Facility</u>

One of the dischargers assessed by SAIC was a chemical manufacturing facility located in Niagara, New York, owned and operated by E. I. DuPont DeNemours & Co., Inc. SAIC projected that to comply with the proposed Guidance, DuPont would have to provide additional treatment (chemical precipitation) for several metals at five of its six outfalls. No treatment was projected for the sixth outfall, which discharges once-through cooling water (at a flow of 36 mgd, compared with a total flow of 17 mgd for the other five outfalls). Based upon that treatment scenario, SAIC estimated compliance expenditures of $7.3 million capital costs, $1.56 million for annual operating and maintenance (O&M) and monitoring costs, $1.7 million for studies, and $780,000 for residuals disposal. However, these estimates have several critical flaws:

(1) In order to install the required treatment units, extensive changes would be needed to the existing wastewater collection system, costing about $8 million. SAIC has not included any portion of those costs.

(2) SAIC has also considered no costs for treating the plant's cooling water flow that discharges through the sixth outfall, based upon its belief that there are no substance levels in that water that would require treatment. That belief is incorrect; levels of zinc and mercury in the cooling water discharge exceed the proposed water quality criteria, and would likely require control under the proposed Guidance. The estimated compliance costs, based on use of chemical precipitation, would be as follows: $11.1 million capital, $2.2 million annual O & M, and $1.4 million for residuals disposal.

(3) SAIC has included no costs for complying with Tier II values. Several Tier II substances are present in DuPont's discharge, and are sometimes found at

levels that would probably require treatment under the Guidance. Since these substances are organics, the metals treatment discussed above will not suffice; another new treatment system (activated carbon adsorption) would be required. Such a system is estimated to have a capital cost of $105 million, and annual O & M cost of $15 million.

Based on the facts described above, DuPont's estimated costs to comply with the proposed Guidance would include about $131 million in capital expenditures and $18.5 million in annual O & M expenses. Those figures are 18 times higher than SAIC's projected capital costs ($7.3 million) and 12 times higher than SAIC's estimated O & M costs ($1.56 million).

II. Fort Howard Facility

Another discharger assessed in the SAIC report was Fort Howard Corporation's paper mill located in Green Bay, Wisconsin. SAIC projects compliance costs for that facility of $2-$6 million. That projection is based on SAIC's belief that Fort Howard could comply with proposed mercury and dioxin limits by conducting pollutant minimization studies, and that no costs would be needed to comply with proposed PCB limits. There are several critical defects in that analysis:

(1) To comply with the PCB limit, EPA suggests that Fort Howard could simply switch to a different source of wastepaper. However, Fort Howard has found (as documented in Fort Howard's comments on the proposed Guidance) that PCB's are found in all types of wastepaper. Therefore, the only way to achieve EPA's specified goal, of eliminating PCB's from the facility's wastewater, would be to switch to a zero-discharge, closed-loop system. Costs of that system are described below.

(2) SAIC believes that Fort Howard could meet the dioxin limit through a pollutant minimization study, for $1-$3 million. However, the facility's process does not generate any detectable dioxin; any levels present in the effluent would be due to either intake water or wastepaper used by the plant. Since dioxin is found in all types and grades of wastepaper that Fort Howard can use, a pollutant minimization program would not be sufficient to comply with the Guidance. Again, zero discharge is the only option that would work.

(3) As with dioxin, compliance with the mercury limit would require, according to SAIC, only a pollutant minimization study, costing $1-$3 million. The most probable source of the mercury is in the plant's intake water or wastepaper. There may also be de minimis amounts of mercury in process chemicals used at the facility. Due to the stringency of EPA's proposed limits for mercury, the National Council of the Pulp and Paper Industry for Air and Stream Improvement ("NCASI") has determined that de-inking facilities such as the Fort Howard plant could not meet EPA's limit even with state-of-the-art wastewater treatment. Zero discharge would be necessary.

In order to implement the zero-discharge option, Fort Howard would need to install several stages of additional treatment to its existing secondary treatment equipment, including filtration, reverse osmosis, evaporation and incineration. The total cost would be $54-$78 million, which is about 15-40 times higher than SAIC's estimate of $2-$6 million for compliance costs at the facility.[1]

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[1] SAIC has also committed basic errors in estimating costs for another paper mill evaluated by the Coalition: the James River Corporation facility in Ashland County, Wisconsin. The most fundamental problem with SAIC's analysis is that they have placed the facility on the wrong water body. SAIC states that the facility currently discharges to the Fox River, while the plant is actually located on Chequamegon Bay, some 200 miles from the Fox River. It appears that SAIC has confused the Ashland Mill with James River's Green Bay Mill, which does discharge to the (continued...)

III. <u>Wisconsin Electric Facility</u>

SAIC also assessed a coal-fired powerplant located in Port Washington, Wisconsin, owned and operated by Wisconsin Electric Power Company. SAIC concluded that a limit would be necessary for mercury, and that to comply, the facility would need only to conduct a waste minimization study, costing $180,000-$330,000.

SAIC's analysis for the Port Washington powerplant does not consider two basic facts: (1) mercury levels in intake water are often well above EPA's proposed criterion for mercury; and (2) trace levels of metals, including mercury, may be found in fossil fuels such as coal. Given EPA's restrictive intake credit proposal, and the possible presence of mercury in the coal supply, it is unlikely that a coal-fired powerplant such as Port Washington would be able to obtain intake credits for mercury under the Guidance. Therefore, if a mercury limit is imposed, the plant would be held responsible to treat any mercury present in its intake water or in coal pile runoff (or other water that comes into contact with coal or coal ash). As documented in a

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[1] (...continued)
Fox River. As a result, SAIC's cost analysis contains some data from one plant and some data from the other. In addition, SAIC has significantly underestimated compliance costs for the Ashland Mill, particularly with respect to zinc and copper treatment. In developing its zinc and copper treatment costs, SAIC committed several errors: (1) it applied data from a totally different industry (metal finishing), which does not show removal of metals to the low levels required by the Guidance; (2) it ignored two of the three treatment steps necessary to treat zinc and copper (precipitation and sedimentation), instead focusing only on the costs of the third step (filtration); and (3) it failed to consider the significant costs for disposal of sludge generated from metals removal.

study by the ENSR consulting firm, Regulatory Impact Analysis of the Draft Great Lakes Water Quality Initiative for the Electric Utility Industry (July 1993), wastewater treatment costs for mercury at a coal-fired powerplant like Port Washington would be about $20 million in capital costs alone. That is about 100 times higher than SAIC's estimated compliance costs ($180,000-$334,000).

IV. Conclusion

The SAIC cost report was the primary basis for EPA's estimate of compliance costs for its proposed Guidance. Based on its review of only three of the plants assessed by SAIC, the Coalition found that the SAIC report contained underestimates of compliance costs ranging from 12-18 times too low to 100 times too low. On a dollar basis, the amount by which SAIC underestimated costs for those three plants totals over $200 million. It is probable that similar underestimates would be found in SAIC's cost analysis of other plants, particularly given the report's undue and unsupported reliance on inexpensive "pollutant minimization studies" when additional treatment systems are probably required, and SAIC's failure to consider compliance costs for cooling water and for Tier II-based limits. It is clear, then, that EPA has greatly underestimated Guidance compliance costs, which are likely to be many times greater than EPA's estimate.

COUNCIL OF GREAT LAKES GOVERNORS

EVAN BAYH
Governor of Indiana

ARNE H. CARLSON
Governor of Minnesota

ROBERT P. CASEY
Governor of Pennsylvania

MARIO M. CUOMO
Governor of New York

JIM EDGAR
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JOHN ENGLER
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TOMMY G. THOMPSON
Governor of Wisconsin

GEORGE VOINOVICH
Governor of Ohio

TIMOTHY P. McNULTY
Executive Director

September 13, 1993

The Honorable Carol M. Browner
Administrator
United States Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Administrator Browner:

Attached is the joint statement of the Great Lakes Governors on the Great Lakes Water Quality Guidance.

This statement represents our consensus recommendations for refinements designed to improve the cost-effectiveness of the final Guidance. We believe these measures will significantly reduce the costs associated with the Guidance, without impairing ecological improvement or the fundamental commitment to a basin-wide system. These recommendations were developed as an outgrowth of an independent assessment of the Guidance conducted for the Council by DRI-McGraw Hill.

This statement also expresses deeply felt views concerning the need to preserve the partnership between the states and U.S. EPA -- a partnership which is reflected in the Steering Committee structure and the consistent view that the Guidance is just that - a Guidance designed to ensure equivalence not regulation designed to impose uniformity for no ecological gain.

Finally, this statement reflects a recognition that the Guidance is another step towards ecological restoration of the Great Lakes, not an end in and of itself. In recognition of this key point, the statement outlines the Governors' vision of a comprehensive toxic reduction effort. It is our intent that this statement provide a new collaborative partnership between the states and U.S. EPA focused on clear toxic reduction priorities.

This statement is not intended to preclude additional comments submitted by the state individually. State comments may focus on concerns in more technical areas or raise issues relating to specific lakes or regulatory systems.

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The Honorable Carol M. Browner
13 September 1993
Page 2

On behalf of the Governors, thank you for your personal attention to this critical issue and your commitment to the Great Lakes. We look forward to working with you and will respond immediately to any items that you feel need clarified.

Sincerely,

George V. Voinovich

George V. Voinovich
Chairman

Council of
Great Lakes Governors

A STATEMENT ON THE GREAT LAKES WATER QUALITY GUIDANCE

By the Governors of the
Great Lakes States

Evan Bayh
Governor of Indiana

Arne H. Carlson
Governor of Minnesota

Robert P. Casey
Governor of Pennsylvania

Mario M. Cuomo
Governor of New York

Jim Edgar
Governor of Illinois

John Engler
Governor of Michigan

Tommy G. Thompson
Governor of Wisconsin

George V. Voinovich
Governor of Ohio

Preamble: Principles For Evaluating The Great Lakes Water Quality Guidance

The following statement reflects the consensus views of the Governors of the Great Lakes states on the Great Lakes Water Quality Guidance (GLWQG) published by the U.S. Environmental Protection Agency in the Federal Register on April 16, 1993.

This statement has been crafted to reflect three fundamental beliefs. First, the comments outlined below recognize the critical need to create a basinwide framework for environmental regulation. The Governors of the Great Lakes states initiated the effort to create a basinwide regulatory system in keeping with the commitment to an ecosystem approach to Great Lakes protection and the prohibition of competition among the states based on environmental standards. The consensus recommendations outlined below seek to ensure regulatory equivalence in the region while recognizing that the complexity and diversity of the Great Lakes ecosystem dictate that a capacity for flexibility be an integral part of that system.

Second, this statement reflects a fundamental commitment to cost-effective toxic reduction. The recommendations outlined below reflect the belief that the GLWQG must incorporate significant steps towards toxic reduction and the virtual elimination of the discharge of bioaccumulative toxins (BCC's) which threaten public health and the ecosystem. But such reduction efforts must also reflect the essential feature that guided successful efforts aimed at reducing phosphorus and other excessive nutrients which posed such an ominous threat to the Great Lakes less than two decades ago: obtaining loadings reductions from multiple sources in the most cost-effective means possible.

The GLWQG is not in and of itself a toxic reduction strategy for the Great Lakes region. As a guideline for the regulation of industrial and municipal dischargers it can not be judged by its capacity to fully protect the Great Lakes. But by the same measure, its approach to regulation must reflect a balanced perception of the role of point source dischargers in contributing toxic loadings and thus, in the comprehensive reduction strategy yet to be fully crafted.

Finally, the focus on cost-effectiveness embodied in this statement seeks to begin a departure from the historic context of the debate over environmental policy. The pursuit of cost-

effectiveness reflects not the desire to find some elusive balance between environmental protection and economic harm that has dominated policy discussions of recent years, but rather to craft strategies which obtain substantive environmental gains while also leveraging investment in improved economic competitiveness.

The Great Lakes Region is the most economically interdependent in the nation. Like the ecosystem itself, there can be no complete economic vitality in any one state without vitality in the others. Similarly, it is unlikely that full restoration of the Great Lakes ecosystem could ever be realized, without Great Lakes industries completing their reemergence as world leaders. The development and deployment of clean technologies and vigorous public/private partnerships for clean-up and restoration all depend on competitive industries.

The comments provided below seek to bring these principles to life in specific recommendations for improving the GLWQG. In submitting these recommendations, the Governors attest to their belief that the Great Lakes Water Quality Initiative can be both the realization of the long-held promise to create a basinwide regulatory framework and a start towards a truly sustainable Great Lakes ecosystem.

Towards A More Effective Great Lakes Water Quality Guidance: Improving The Clarity And Cost-Effectiveness Of Key Provisions

These consensus recommendations have in large part been derived from an analysis of the GLWQG conducted for the Governors by DRI-McGraw Hill. The goal of this study was not to obtain regional consensus on a precise estimate of costs and benefits, but to provide an independent assessment of likely cost and benefit ranges, and identify specific provisions of the GLWQG that warrant modification.

The DRI study concluded that the GLWQG will have the limited though important ecological benefit of generating a significant reduction in dioxin loadings without, in and of itself, significantly weakening Great Lakes competitiveness. However, the DRI study also found that the proposed guidance contains provisions which have the potential to create significant cost "spikes" without contributing to meaningful toxin reduction.

The Great Lakes Governors strongly recommend that the following modifications be pursued to improve the clarity and cost-effectiveness of the Guidance:

> *THE FINAL GUIDANCE SHOULD MAINTAIN A WORKABLE SYSTEM FOR INTAKE CREDITS*
>
> The proposed guidance states that if a facility withdraws all its intake water from the receiving stream and does not add any mass of the pollutant of concern, it will be determined that there is no reasonable potential for the facility to violate standards due to their discharge and no limits are necessary. If these criteria are not met, a routine reasonable potential analysis must be conducted. Where background levels of the

pollutant exceed standards, the limits must be set to zero or a multiple source Total Maximum Daily Loading (TMDL) developed that assures attainment of standards.

The goal of this provision is clear; it seeks to create a disciplined procedure for ensuring that dischargers are not required to treat waters utilized for cooling or other procedures when they contribute nothing to the level of contamination. However, the Guidance requires dischargers to demonstrate that they "do not add any additional mass" or "increase the pollutant concentration" (Procedure 5 E.1b and E1.d).

A strict interpretation of this requirement for showing reasonable potential could result in state agencies facing third party legal action or dischargers adding costly treatment in cases where an evaporation effect raises the mass or concentration levels of pollutants. In addition, under the proposed guidance, a discharger would not be eligible for an intake credit for the level of a pollutant already present in the intake water if the discharger adds even a deminimus amount of that pollutant to the waste stream. This would be true even where the facility's ultimate discharge of that pollutant contains no more of the pollutant than the level of the pollutant in the intake water. An intake credit should be allowed in such circumstances.

The final guidance should unambiguously provide that dischargers are not responsible for pollutants they do not add to the water body.

According to the DRI study this action would reduce roughly 40 percent of the difference between the accepted best and worst case estimates of $500 million and $2.3 billion in annual costs to the region without jeopardizing important environmental improvements.

A MORE REASONABLE MERCURY CRITERION SHOULD BE ADOPTED

Recent research on mercury levels conducted over the last year raises serious concerns over the level set in the Guidance. The level set, .18 ng\l, is <u>below</u> levels found in settings unaffected by man. This suggests that the 0.18ng\l limit is unnecessarily stringent. While the Governors will not specify a reformulated level, it is clear that action to determine a new level is needed and some of the considerations that should be integrated into setting a new level are also clear.

The final guidance should contain a recalculated mercury criterion. Additional research, focusing on the toxic form of mercury (methyl mercury) and more science on the relationship between forms of mercury in the environment are needed.
According to the DRI study, development of a more reasonable mercury criterion would reduce the difference between the best and worst case cost estimates by 10 percent, without jeopardizing important environmental improvements.

REFINEMENTS OF THE ANTI-DEGRADATION PROVISIONS ARE NEEDED

The anti-degradation provisions of the Clean Water Act are an important tool maintaining sustained commitment to improved protection. Unlike other elements of the GLWQG, which reflect conditions specific to The Great Lakes ecosystem, anti-degradation is an issue of national scope. The Governors have concerns over two specific elements of the anti-degradation provisions in the GLWQG and their ability to meet the objectives for rigorous protection and investment in prevention and clean technologies.
In particular, the Governors wish to minimize any potential that the anti-degradation provisions create a bias against investment in new and expanded facilities, which hold the best hope for increased use of pollution prevention and clean technologies.

The first issue concerns the definition of High Quality Waters. The Guidance requires any discharger proposing to significantly lower water quality in "High Quality Water" must submit an anti-degradation demonstration for consideration by the permitting authority. The current definition of High Quality Waters is so broad as to require implementation of anti-degradation procedures for drainage ditches, since HQW is defined as any body of water where water quality exceeds standards on a pollutant by pollutant basis. Such rigor is warranted in all waters for BCC's -- which will not dilute or lose persistence. But for other Non-BCC pollutants, such approaches could be costly and provide little environmental return.

Second, the Guidance requires Existing Effluent Quality procedures for biaccumulative toxins be placed in permits unless and until an anti-degradation review is conducted by the permitting authority. This is an important step towards reducing loadings of BCC's and could be a stimulus for innovation. Care must be taken, however, to ensure that the EEQ approach does not produce a disincentive to investment. As currently outlined, EEQ limits would be set based on past performance. Thus, a facility which had made an extensive investment in loadings reductions would have a lower limit than firms making no effort to increase loadings reductions beyond permit levels. Such a system could, if not carefully crafted, create an unintended disincentive to investment in clean technology.

The Governors strongly recommend the following to help create an approach to anti-degradation which is environmentally and economically effective:

- The final Guidance must contain a more focused definition of High Quality Waters. The definition should clearly distinguish between water body subsets. Clear Anti-degradation provisions should be applied in cases involving BCC's in all bodies of waters and any pollutants in waters which clearly meet intent of the HQW definition.

- Further dialogue between the states and U.S. EPA is required in order to craft the final EEQ provision which fosters rigorous protection without in any way discouraging reductions.

MITIGATING COSTS THROUGH FLEXIBILITY AND INNOVATION

The focus of the preceding recommendations is to reduce costs without lessening the ecological gains of the GLWQG. As indicated, these actions will reduce potential costs by 50% while lowering the economic impact in a worst case scenario to slightly over $1 billion annually.

The challenge is to craft provisions which utilize flexibility to substantively mitigate costs without reducing the ecological benefits or weakening the goal of establishing regulatory equivalence within the basin.

As a collective, the Governors believe additional cost reduction can be secured by vigorously pursuing the provisions of the Guidance which introduce flexibility and creative regulation.

The Governors recommend the following actions:

- **The final Guidance should maintain provisions for variances.**

- **Where possible, certifiable prevention efforts could result in fee, permit length, and other forms of flexibility. The Council has worked closely with members of the Great Lakes House and Senate delegations to frame such a model--"the Great Lakes Pollution Prevention Demonstration Program" contained in S.1183. This program could provide insights on incorporating responsible flexibility into the GLWQG.**

- The GLWQG contains a description of the potential to develop trading schemes and other market mechanisms (p.160) in cases not involving the elimination of mixing zones for BCC's.

  The application of trading schemes or other approaches raised by DRI -- such as atmospheric deposition credits -- requires extensive examination. The task of applying such approaches to water without jeopardizing the virtual elimination of the discharge of BCC's will not be easy. Not every Great Lakes state is prepared to endorse this effort. Where state interest exists, such efforts should be incorporated into the development of Lakewide Management Plans or in other lake specific approaches.

- In the debate over the re-authorization of the Clean Water Act, strong consideration should be given to extending permit lengths to provide greater stability and more favorable investment and financing conditions for dischargers.

Such actions would establish cost-mitigating options without lessening ecological protection or regulatory equivalence. More directly, the Governors believe such actions would mitigate costs without retreating from the critical contribution the elimination of mixing zones for BCC's holds for the region.

With timely and vigorous pursuit of these types of approaches, costs of the GLWQG could be lowered significantly further–nearing $500 million dollars annually in a worst case scenario.

Beyond The Comment Period: Ensuring The Effective Implementation Of The Guidance

The recommendations outlined above are designed to maximize the cost-effectiveness of the GLWQG. Effective regulation in large part depends, however, on an effective framework for implementation. One of the most innovative features of the GLWQG is the fact that it is truly the byproduct of collaborative dialogue–among the states and federal government, and among a variety of stakeholders in the Great Lakes basin. The close of the comment period represents a critical juncture for the Great Lakes Water Quality Initiative. Two very divergent paths are possible. One path would maintain the framework and spirit of collaboration that is reflected in the Guidance. A second path would lead to more hierarchial, distant, and competitive interaction among the states, U.S. EPA and stakeholders in the region.

The Governors believe that the effectiveness of the Guidance in creating a basin-wide regulatory framework and providing a point of departure for a comprehensive toxic reduction strategy depends upon maintaining the structure and context for collaboration and partnership. The recommendations outlined in this section are focused on ensuring effective implementation of the final Guidance.

- *THE STEERING COMMITTEE STRUCTURE MUST BE MAINTAINED*

The first step towards ensuring that the implementation of the final Guidance reflects the spirit of collaboration which marked the initiation of this effort is to maintain the operation of the Steering Committee. The Steering Committee structure is the fundamental mechanism for the states and U.S. EPA to work collaboratively. The failure to maintain the Steering Committee would inhibit both successful implementation of the Guidance and progress on subsequent phases of the Great Lakes Water Quality Initiative.

Following completion of the public comment period, U.S. EPA should reconvene the Steering Committee and maintain its operation on an ongoing basis during finalization of the Guidance.

- *THE INTENT OF THE CRITICAL PROGRAMS ACT TO CREATE A REGIONAL "GUIDANCE" MUST BE PRESERVED*

The Critical Programs Act of 1990 which created a legislative mandate for the voluntary effort to create a basin-wide regulatory framework is very clear about its intent for implementation of the Guidance. The Act calls on the states to develop regulations which are "consistent" with the final Guidance. The preamble to the Guidance contains U.S. EPA's interpretation that consistency mandates verbatim adoption of the final Guidance. Such an interpretation does violence to the legislative intent and spirit of the Critical Programs Act.

The Critical Programs Act recognizes the need for creating a basin-wide regulatory framework—sufficient consistency in pollutant criterion, and key regulatory issues such as anti-degradation, intake credits, and mixing zones to make ecosystem strategies possible and preclude any potential for environmentally destructive competition among the states in the region. In certain cases consistency may require a rules approach, but there is no basis in either the language or the spirit of the Critical Programs Act for U.S. EPA's interpretation that verbatim adoption is necessary to obtain regional harmony.

Verbatim adoption shifts the focus of regional environmental policy from outcomes to procedures. To require verbatim adoption is to deny the very essence of the Great Lakes ecosystem and its unique characteristics of interconnectedness amid diversity. Moreover, verbatim adoption would stifle the LaMP process and the wealth of innovative activities underway in areas such as Green Bay in which U.S. EPA has been a vital partner. Finally, a requirement for verbatim adoption is likely to ensure that the final Guidance produces far more litigation than real progress towards harmony and toxic reduction. The region has no time or resources for the future U.S. EPA is inviting with this interpretation.

The final Guidance should recognize that consistency requires harmonious adoption of key provisions which establishes regulatory equivalence, not verbatim adoption which stifles innovation, creativity and due process.

- *A CLEAR PATH FOR PURSUIT OF SUBSEQUENT PHASES OF THE GREAT LAKES INITIATIVE MUST BE ESTABLISHED IMMEDIATELY*

This statement has consistently emphasized the point that the Guidance is only a beginning. The GLWQG is only a first step towards restoring the Great Lakes ecosystem and protecting human health. With modifications, it holds the potential to provide a cost-effective framework for basin-wide regulation and make an important contribution to reducing loadings of dioxin—one of several major threats the Great Lakes ecosystem.

Timely, but focused efforts must now begin to address non-point toxic discharges. The great danger is that subsequent actions which seek to tackle non-point problems--the greatest source of toxic loadings--may lack comprehensiveness, choosing only those non-point sources associated with current legislative action.

The debate over the GLWQG has been useful and productive. One result of the discussion has been to re-awaken public recognition of the true state of the Great Lakes and the complete actions needed to restore the ecosystem. Therefore, the Governors believe that subsequent phases of the Great Lakes Initiative should be crafted along the following lines:

- **Move expeditiously to target specific BCC's which are major contaminants to the Lakes and for which specific cost-effective reduction strategies are currently available and actionable.**

- **Engage in synthesizing data and information and completing assessments of the specific sources of critical contaminants.**

- **Maintain and expand a multi-stakeholder effort to identify options for comprehensive, multi-source strategies for obtaining loadings reductions.**

- **Form linkages between RAP, LaMP, and other regulatory acts such as implementation of the Clean Air Act, and the Great Lakes Initiative.**

A regional "toxic reduction summit" on either a basin or lake-by-lake basis could well provide the starting point for the type of timely, but prioritized and comprehensive effort that will be required. Moreover, such a summit would capitalize and enhance public recognition of the challenges facing the basin.

The vision of subsequent phases of the Initiative outlined above largely reflects the strategy which the region applied to win its battle against nutrient pollution--set clear objectives for loadings reductions and target the full range of sources for the most cost-effective reduction strategies. Any effort which fails to combine timely action on priority BCC's with a comprehensive focus on all sources will fail to fulfill the commitment to truly restore the Great Lakes ecosystem.

CONCLUSION

This statement has been crafted in a spirit of shaping a more effective Great Lakes Water Quality Guidance. The citizens, governments, and industries of the Great Lakes region have consistently demonstrated a willingness to make the commitments and investments of energy and resources necessary to protect the treasure we share. With the modifications suggested in this

statement, the Great Lakes Water Quality Guidance can make an effective contribution to this effort, by establishing regulatory harmony and significantly lowering loadings of dioxin.

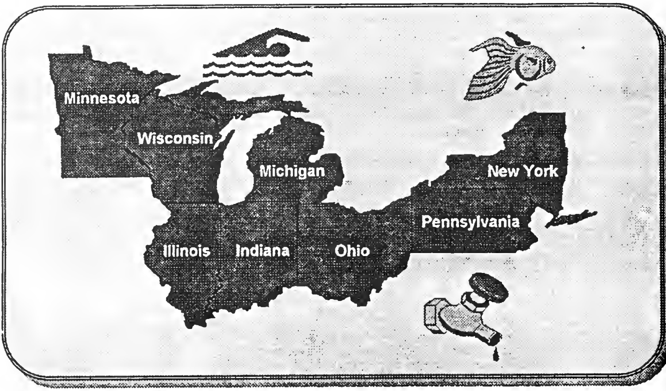
The recommendations outlined above will lower the costs of the GLWQG without jepordizing significant environmental improvement or the realization of a basin-wide regulatory framework. By expanding the flexibility open to industry to meet environmental objectives, the recommendations will help ensure that prevention and innovation are the hallmark of industry and municipal compliance strategies and open the door to creative multi-source reduction efforts. Finally, the recommendations outlined in this statement will help ensure that the Guidance can be effectively implemented.

Perhaps the most important outcome stemming from the formulation of the Guidance, is a reawakened appreciation for the extent to which this region's economic and environmental futures are entwined. As important as the Great Lakes Water Quality Guidance is, it will not restore the Great Lakes ecosystem. All parties to this Initiative must return to the public and articulate the critical need for a comprehensive toxic reduction effort. The starting point for such an effort must be recognition that the competitiveness of Great Lakes industries can and must be reflected in all environmental strategies. With such a recognition in mind, the Governors of the Great Lakes states submit these recommendations for finalization of the Great Lakes Water Quality Guidance.

The Great Lakes Water Quality Initiative:
Cost Effective Measures to Enhance Environmental Quality and Regional Competitiveness

Prepared for:

Council of Great Lakes Governors
Chicago, Illinois



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Glossary

BAF	Bioaccumulation Factor
BCC	Bioaccumulative Chemicals of Concern
DNR	Department of Natural Resources
DRI	DRI/McGraw-Hill
EPA	U.S. Environmental Protection Agency
GLI	Great Lakes (Water Quality) Initiative
GLWQG	Great Lakes Water Quality Guidance (also, "Draft Guidance")
IJC	International Joint Commission
LAMPs	Lake-wide Area Management Plans
NPDES	National Permit Discharge Elimination System
PAH	Polycyclic Aromatic Hydrocarbons
PCB .	Polychlorinated Biphenyls
PCS	Permit Compliance System
POTW	Publicly Owned Treatment Work
RAPs	Remedial Action Plans
RIA	Regulatory Impact Analysis
SIC	Standard Industrial Classification
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WQBEL	Water Quality Based Effluent Limit
WQC	Water Quality Criterion

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Executive Summary

At the request of the Council of Great Lakes Governors, DRI/McGraw-Hill (DRI) has evaluated the economic and environmental impact of the Great Lakes Water Quality Initiative (GLI). We based our review on the Draft Guidance released on April 16, 1993.

Our major objectives were to:

- Project the direct costs of compliance for the GLI and the overall economic impact on the eight-state economy of the Great Lakes Region;
- Assess changes in water quality and impacts on beneficial uses of the Lakes that are likely to result;
- Determine which provisions of the GLI are the least cost-effective; and
- Recommend ways to improve cost-effectiveness of GLI without compromising environmental quality.

The purpose of the Great Lakes Water Quality Initiative is to establish uniform water quality standards for toxic chemicals within the Great Lakes basin and to use these standards in negotiating revised water quality objectives with the Canadian government under the Great Lakes Water Quality Agreement as amended in 1987. Hoping that such an initiative would reduce confusion in regulating the discharge of toxic substances and create a more "level playing field" for industry location decisions, the governors of the eight Great Lakes states participated in a Steering Committee that forwarded proposals to the EPA in 1992.

A. The Draft Guidance Contains Several "Cost Triggers"

DRI's estimate of the direct incremental compliance costs attributed to the GLI will range between \$710 million and \$2.3 billion per year. This range reflects two types of uncertainty, technological and regulatory. *Technological uncertainty* includes the difficulty of predicting how successful dischargers will be in meeting the stricter limits by using inexpensive pollution prevention techniques and changes to cleaner manufacturing processes, versus costly end-of-pipe treatment technologies. *Regulatory uncertainty* refers to the lack of consensus among state and federal officials, let alone permit holders and outside experts, regarding the precise impact of GLI on existing permits. Efforts are currently under way to address both issues, and this report's recommendations are directed specifically toward reducing regulatory uncertainty.

DRI's cost estimate is in sharp contrast to the cost range of \$80 to \$510 million annually put forth in the EPA cost study.[1] The key differences are (i) that DRI is less optimistic than the EPA about the ability of "waste minimization studies" to resolve the technological issues, and (ii) our estimates take into account the potential cost consequences of the GLI

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1 SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, April 16, 1993, *Assessment of Compliance Costs Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance.*

implementation procedures -- the elements of the package that distinguish it most from existing state regulations

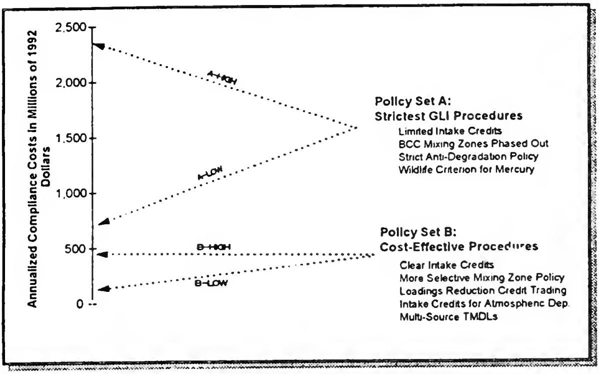
Four specific provisions in EPA's Draft Guidance contain elements that drive up the costs of GLI without delivering commensurate benefits. These include:

- lack of a clear, sensible approach to **intake credits**;
- a rigid **anti-degradation** policy that leaves little room for new plants with cleaner processes,
- the phasing out of **mixing zones** for Bioaccumulative Chemicals of Concern (BCCs), and
- the **wildlife criterion for mercury**, which aims at reducing concentrations of this naturally occurring element to below levels found in pristine conditions.

DRI drew heavily from the EPA cost study, which represented the most comprehensive review to date of the universe of existing dischargers, and from five engineering studies funded by trade associations, providing detailed analysis of treatment options for specific sectors. "Worst case" cost estimates provided by the trade association studies, combined with unsupported statements from other sectors total in excess of $10 billion per year. In our assessment, however, the chances are remote that direct costs will rise above the cost range we report.

Exhibit ES-1

GLI Compliance Cost Estimates for Four DRI Scenarios



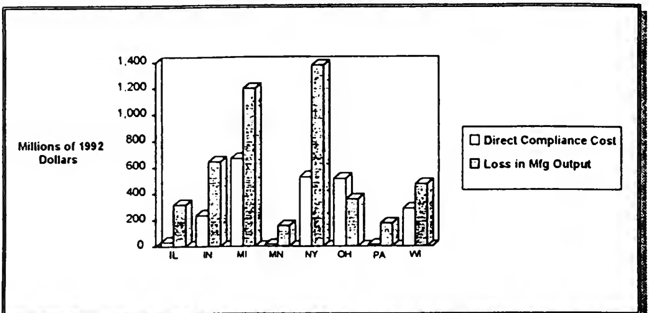
On the other hand, the prospects are excellent for reducing costs below the DRI Policy Set "A" projection. As shown in Exhibit ES-1, if certain GLI provisions can be modified, direct compliance costs for Policy Set "B" correspond closely to the cost range set forth by EPA. The measures proposed to bring the costs down to this range are discussed later in this Executive Summary.

B. No State Will Escape The Economic Impact

To assess the impact of GLI on the region's competitiveness, we built the DRI Regional Model of the Great Lakes Economy, which captures inter-industry linkage effects. This allowed us to track the transmission of economic impacts not only from sector to sector, but from state to state as well. One of the important messages of this research is that **no state will escape the cost impacts of GLI**. States such as Illinois, Pennsylvania and Wisconsin, each of which have fewer than 2% of the dischargers in the Basin, will experience losses in manufacturing output on the order of ten times the direct compliance costs of facilities located in their states (see Exhibit ES-2).

Exhibit ES-2

Comparisons Between Compliance Costs and Loss in Manufacturing Output by State
(Scenario A-High, Year 2005)



New York and Michigan, however, will together account for 55% of the $4.7 billion of industrial output that will be lost each year if DRI's worst case scenario prevails. Not only do these two states contain the majority of the Basin's 588 major dischargers, but their economies are extremely dependent on demand from industries in other states.[2] For example, when compliance costs cause firms in the other states to contract, demand for auto parts from Michigan and business services from New York fall. **Therefore it is clear that the eight states need a joint solution that ensures cost-effectiveness, because economic impacts cross state boundaries just as easily as air and water pollution.**

The three sectors that will be hit the hardest are primary metals, transportation equipment, and non-electrical machinery. The iron and steel industry is hardest hit due to its high projected direct compliance costs ($480 million per year), while the other two are affected primarily through higher costs for their key inputs, and charges (or stricter pre-treatment requirements) from their local municipal sewer districts. The paper and pulp industry has compliance costs nearly as high as the steel industry, but it should be more successful in passing on costs to its customers, so output will not fall nearly as much in this sector.

Will GLI significantly reduce the region's competitiveness? The short answer is no, since the absolute magnitude of the effect is small The fall in manufacturing output is at most

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2 In the scenarios where cost-effective features are added to GLI, Michigan's relative share of the economic impact is far lower, because that version of GLI closely resembles Michigan's already strict regulations.

only one-third of one percent, and the loss in employment is less than 0.1%, these impacts will be nearly imperceptible in all but a few sectors. The drop in personal income will average from $6 to $23 per person per year, surely a small price to pay if the GLI could, for example, return the Lakes to a near-pristine condition.

However, GLI falls well short of that environmental goal, and the economic impacts will represent just one more nick in the region's competitiveness. Good policy demands that not very many regulations with price tags of this magnitude be adopted, because a series of small cuts in efficiency, each one affordable on its own, will collectively spell economic stagnation. On the other hand, making cost-effective modifications to GLI will preserve economic resources and public willingness to tackle other urgent problems in the Great Lakes ecosystem, such as atmospheric deposition, contaminated sediments, and loss of habitat.

The DRI Great Lakes Regional Model reveals that the loss in personal income will be less than half the foregone manufacturing output for residents of the Great Lakes states (see Exhibit ES-3). This large difference is explained by the fact that building treatment facilities is a fixed cost, hitting industries that are already capital-intensive. Compared with other policies with a similar direct cost, this kind of intervention threatens fewer jobs, and the cycle of income and expenditure losses that normally result from layoffs is suppressed.

Thus, rather than workers, business profits are exposed to greater losses,[3] and except in rare cases where establishments are shut down because of GLI, economic distortions will be relatively minor. For example, costs of abatement of mercury emissions from coal-fired power plants (a "non-point" source) would have a far higher "multiplier effect" via electricity rate hikes. Because different pollution reduction methods can have such widely varying indirect impacts, **the total economic cost should always be compared when making policy choices.**

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[3] Since many of these firms are national or international in ownership, GLI actually shifts some of the burden outside of the Region.

Exhibit ES-3

Summary of Economic Impact Analysis
(Millions of 1992 Dollars)

	Scenarios			
	B-Low	B-High	A-Low	A-High
Direct Compliance Cost	59	381	709	2,286
Loss in Personal Income	43	319	484	1,880
Loss in Manufacturing Output	111	795	1,222	4,694
Employment Loss (# of Jobs)	745	5,402	8,649	33,230

C. The Environmental Benefits of GLI will be Modest

Although the goals of the GLI process are not all matters of tangible benefits and costs,[4] it is nevertheless crucial that policy makers recognize just how limited the impact of GLI will be on actual water quality.

According to the states' biennial water quality reports to Congress and other sources, GLI toxins are not responsible for any impairments to drinking water or swimming in the Lakes. However, almost none of the shoreline miles along the Lakes meet their designated uses for fish consumption. Moreover, current concentrations of toxic substances seriously impair aquatic life, as well as many wildlife species such as cormorants and eagles that depend on fish for food.

Twenty-eight substances have been labeled as bioaccumulative chemicals of concern (BCCs) because they tend to accumulate to increasing concentrations along the food chain, and for this reason GLI procedures are most strict with these substances. Exhibit ES-4 shows the seven GLI contaminants that are responsible for fish consumption advisories.

4 For example, showing progress under the Great Lakes Water Quality Agreement may give the US a valuable bargaining tool in on-going negotiations with Canada, which is responsible for a significant portion of the contaminants in the Lakes.

Exhibit ES-4

The Use of PCBs and Most of the Other Contaminates that Cause Fish Consumption Advisories Is Banned or Severely Restricted.

Contaminants Responsible for Fish Consumption Advisories in the Great Lakes

	Contaminant						
Water Body	Chlordane	DDT	Dieldrin	Dioxins*	Mercury	Mirex	PCBs
L. Superior	X				X		X
L. Michigan	X	X	X		X		X
L. Huron							X
St. Clair R.					X		X
L. St. Clair					X		X
Detroit R.					X		X
L. Erie	X						X
Niagara R.				X		X	X
L. Ontario				X		X	X

* Dioxins and/or dibenzofurans

Note: Wisconsin has issued advisories due to "pesticides" (chlordane, DDT, dieldrin, or toxaphene) for Lakes Michigan and Superior

If GLI could make significant progress toward eliminating the fish advisories, a whole host of environmental benefits could be estimated in dollar terms, and contrasted with the costs. Making the fish safely edible for humans and wildlife would lead to increased commercial fishing income, recreational fishing with all its tourism spin-off effects, enhanced enjoyment of the wildlife by residents and park visitors, and possible improvements in health among a small human population that regularly ignores the fish consumption advisories. These benefits are difficult to calculate accurately, but if GLI could achieve them, it would be worthwhile computing them, so that we could compare the benefits with their associated costs.

Unfortunately, of the toxins causing fish advisories, only dioxin will experience a significant reduction in total loadings as a result of GLI. Under the most optimistic assumptions, mercury loadings from municipal and industrial point sources -- the only sources addressed by GLI -- will be cut by 80%.[5] However, known sources of mercury deposition from the atmosphere are estimated at ten times the point source contributions, as shown in Exhibit ES-5, and other sources of this naturally occurring substance may also be significant.

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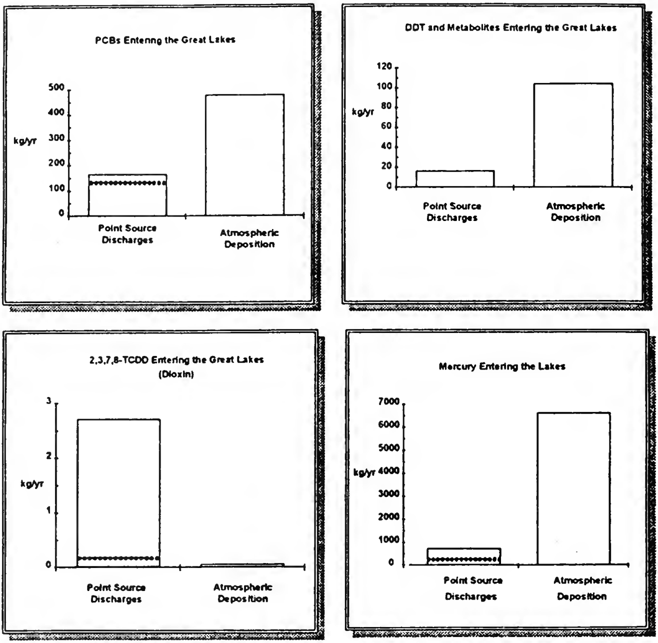
[5] And reductions of that magnitude for mercury is a "cost trigger" on the compliance side.

Exhibit ES-5

Point Source Contributions Are Dwarfed for Most BCCs by Atmospheric Deposition



Dotted line indicates estimated point source loadings after GLI
(Maximum potential reduction assuming discharges occur at calculated permit limits)

Sources: Eisenreich & Strachan, 1992; SAIC, 1993; EPA Permit Compliance System, 1991

Thus, GLI's impact on levels of mercury, PCBs and other chemicals of concern will be completely ineffective in isolation. Because of the large quantities of PCBs already in the ecosystem, levels of that pollutant are not expected to fall below the determined thresholds for fish advisories for decades, after which GLI's point source limits will have been fully responsible for the elimination of only one chemical causing fish consumption advisories, dioxin.[6]

This study explores many issues regarding the exact loadings reductions that can be achieved by GLI, and there are many uncertainties and questions that our current scientific data simply cannot answer yet. But the conclusions presented above are solid and accepted by nearly all researchers familiar with the problems of toxic chemicals in the Great Lakes. There is a wider debate about the correct strategy to achieve improved water quality, but even there, all observers agree that the non-point sources, including contaminated sediments, atmospheric deposition, and leaking waste sites, contribute a far greater share of these toxins than point sources contribute.

Partly because Executive Order 12291 required EPA to conduct a full Regulatory Impact Analysis (RIA) of GLI, EPA has estimated monetary values of both costs and benefits. The technical uncertainties involved in putting these dollar values on benefits are an order of magnitude greater than for costs, and the RIA is profoundly ambiguous about whether GLI will account for as much as 50% or as little as 1% of the benefits of a contaminant free fishery.[7] Even using relatively optimistic assumptions about cost and benefits,[8] the RIA concludes that costs have a better than even chance of exceeding monetizable benefits. The Council of Great Lakes Governors wisely instructed DRI not to attempt to put monetary values on benefits in our analysis, since that exercise sheds so little light on practical policy questions. DRI believes measuring benefits through loadings reductions and assessing changes in beneficial uses is appropriate for this cost-effectiveness study.

DRI follows many state and federal environmental officials in supporting the application of a true ecosystem approach to developing environmental standards. Such an approach would fully consider all sources and fates of contaminants in the Great Lakes basins, as well as their biological and physical characteristics. This is much closer to the approach taken in Lakewide Area Management Plans (LAMPs), which concentrate on achieving solutions to lake-specific problems no matter what their source.

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6 Due to stringent existing regulations of dioxin, and process changes already under way in the paper industry, it can be argued that GLI itself would not be necessary to achieve this goal.

7 RCG/HAGLER, BAILLY, INC., April 15, 1992, *Regulatory Impact Analysis of the Proposed Great Lakes Water Quality Guidance, Final Report*. Prepared for the US EPA.

8 EPA loadings reductions for evaluating benefits assume that current discharges are at the permit limits, while all cost scenarios assume that many facilities discharge at well below their permit limits. In addition, the use of EPA toxic-weighted loadings reductions blurs the distinction between chemicals discharged and chemicals impairing beneficial uses. These discrepancies bias any direct comparisons.

D. Cost Effectiveness can be Achieved with Minimal Loss of Benefits

The alarming outcomes described in DRI's Scenario A need not ever take place, if certain elements of the Draft Guidance can be re-thought and revised. The following list summarizes these elements along with the corrective measures that DRI recommends:

- Procedures governing *waste load allocations*[9] and *reasonable potential to exceed water quality standards* must be revised to allow for a sensible system of **intake credits**. Dischargers who use and return waters to the same water body should be allowed to discharge at the background concentration or between background and criteria. The use of tiny amounts of metal-based algaecides, and slight increases in concentrations due to evaporation should be explicitly addressed.
- The phased *elimination of mixing zones* for BCCs strives for loadings reductions as much as ten times beyond the already conservative wildlife criteria. For BCCs such as mercury and PCBs, whose loadings are predominantly from non-point sources, the benefits of these additional reductions are minute, while removal costs begin to rise exponentially at these concentrations. Granting municipal sewer districts "**intake credits for atmospheric deposition**" may mitigate the problem, since a good case could be made that cities should not be responsible for treating pollutants that literally rain on them from the sky. Instituting **multiple source total maximum daily loads**[10] would provide that dischargers of chemicals with high non-point source contributions are not required to bear a disproportionate share of the burden.
- The *anti-degradation* policy preserves existing water quality when it is better than the standard, by limiting new discharges from new and existing plants. However, in doing so, it freezes the status quo, so that a proposed plant using a cleaner process may be blocked while older plants jealously guard their right to discharge at historical levels. Devising a **scheme for trading of loadings reduction credits** with an offset factor would allow environmental improvements to take place alongside economic growth, changing a zero-sum game to a positive-sum game. Clearer handling of the allowance for higher loadings when there is an *important social or economic benefit* will also mitigate this problem.
- **More than any other substance in the GLI, the criterion set for mercury acts as a cost trigger.** It appears in nearly 50% of the existing permits sampled and is forecast to account for over 30% of the attributable costs of GLI in 1997, but this will only represent the tip of the iceberg in terms of projected costs of compliance. With mercury criteria set at concentrations 1,000 times more sensitive than EPA's current approved detection limits, the detection limits dictate how stringent individual permits will be. However, detection limits will inevitably improve with scientific progress, and coupled with mixing zone elimination, eventual loadings reductions will be literally

9 In this section, italics indicate terms already defined under GLI; those in bold are DRI proposals.

10 The phrase "multiple source TMDLs" is mentioned in the Draft Guidance twice in Appendix E under Procedure 3 (3A. C. 4 on page 295 and 3B. C.3 on page 299) but is not defined. DRI has assumed a definition supported by discussions with state level permitting officials.

impossible to achieve with any known treatment technology, especially for municipal sewer systems with their enormous flow volumes.

Many of the recommendations made above can mitigate the mercury problem, but there is also scientific grounds to question the criterion itself. To prevent a cost spike where incremental benefits of point source mercury reductions are minimal, DRI recommends that the EPA either **revise the mercury criterion upward.**

- A final measure that would reduce regulatory uncertainty without significant environmental impact would be to **extend the life of permits** from five to ten years once GLI limits are reflected in permits. Business would be able to make investment decisions with longer time horizons, and further adjustments in permits, while delayed, would still be rapid relative to the ecological processes taking place in the Lakes.

E. Is the Great Lakes Water Quality Initiative Affordable?

Too often in public policy-making the question ***"Can we afford ..."*** to undertake some laudable goal is the most important question posed. However, this obviously fundamental inquiry can easily obscure the fact that, while we might indeed be able to ***afford*** a particular remedy, it may be much less effective than many other alternatives. Secondly, a consistent policy of adopting environmental remedies--each of which ***"we can afford"***-- that are not the most effective will eventually both leave us short of our overall goal of a cleaner environment and out of resources to tackle the next societal challenge. In other words, if we fail to emphasize the question of cost-effectiveness, ultimately we will ***"NOT be able to afford"*** the goal of a cleaner Great Lakes Region."

Why in our policy-making is there inevitably more emphasis on ***"what we can afford"*** than on ***"what is most cost-effective"***? A cursory evaluation of policy-making in the U.S. reveals two primary reasons. either the best options (1) are beyond the immediate scope of the regulatory body that must "solve" the environmental problem or (2) require political compromise or leadership that is difficult to muster.

In this analysis, DRI assumes in its cost projections for DRI Policy Set B that the factors causing potential cost spikes will be addressed. Since the EPA cost study did not incorporate these factors, it should not be surprising that DRI's range of cost estimates for Policy Set B corresponds closely to the EPA's range of $80 to $510 million annually. The main difference between the two estimates is that direct costs for Michigan are roughly half their magnitude in the EPA estimates, because DRI took into account the relatively strict nature of Michigan's existing regulations.

Given the broad public support for improved water quality in the Lakes, and the tangible and intangible benefits that implies, clearly the GLI process will go forward. The costs per person, ranging from 50¢ to $4 each year if the cost spikes are remedied, do not appear onerous, and future generations may yet thank this generation for taking a conservative approach to toxic levels in this unique ecosystem.

I. Great Lakes Water Quality Initiative: Choices Amid Uncertainties

The Great Lakes Water Quality Initiative (GLI) represents a coordinated effort by the eight states in the region to improve water quality in the Great Lakes. The GLI achieves this by standardizing around relatively strict water quality criteria and regulations for implementing permits. Given the structure of current state and federal laws, the GLI will affect only municipal and industrial facilities whose discharges are already currently regulated. By further restricting existing permits, pollutant loadings into the Lakes will be reduced, but this also imposes costs on those dischargers that install new treatment facilities.

This report, prepared by DRI/McGraw-Hill (DRI), assesses the economic and environmental impact of the Initiative, as expressed in the EPA Draft Guidance released on April 16, 1993.

Our major objectives have been to:

- Project the direct costs of compliance for the GLI and the overall economic impact on the eight-state economy of the Great Lakes Region;
- Assess changes in water quality and impacts on beneficial uses of the Lakes that are likely to result;
- Determine which provisions of the GLI are the least cost-effective; and
- Recommend ways in which the GLI could be modified to improve cost-effectiveness without compromising environmental quality.

One of the foremost considerations in the design of the study was the necessity of circulating a draft for public distribution early enough into the comment period for state officials and others to utilize the DRI results when formulating their own comments to the EPA. This urgency, combined with the perception that many public and private GLI participants have conducted extensive scientific, engineering and economic analyses on specific aspects of the GLI without building a comprehensive, balanced document suitable for public policy debate, suggested that the Council of Great Lakes Governors could fill the information gap by sponsoring a rapid review of economic costs and environmental benefits based largely on existing sources.

Accordingly, the resources allocated for this study were not intended to cover the costs of conducting new surveys, visit individual facilities or generate raw information through new research. The key exception to this general principle was the creation of the DRI Model of the Great Lakes Economy, which brought into the public domain information about linkages and responses in the Great Lakes economy that was not previously available.

This chapter presents the issues and choices that Great Lakes policy makers face, given the GLI as currently written. DRI has identified several implementation procedures that have the potential to create cost "spikes" without reducing loadings and improving

beneficial uses significantly In some cases. these problems can be remedied by making the language and intent of the Guidance more clear; in other cases, existing procedures need to be altered. or new ones created, to resolve the problem.

DRI has developed four policy scenarios that estimate the range of costs of the GLI assuming different policies. Under the strictest implementation of GLI, the direct compliance costs range from $710 million to $2.3 billion; under more lenient GLI procedures, the direct compliance costs range from $60 million to $380 million. As will be seen in this and subsequent chapters, the projected costs are high in relation to the projected benefits of GLI.

The chapter begins with a summary description of the Initiative, and lays out the framework DRI used to analyze the initiative. The decision not to compare estimates of dollar values of benefits with costs, but rather to use cost-effectiveness as a criterion, is explained. Sections C and D introduce our critique of the key implementation procedures, and our proposed solutions. The final sections summarize the DRI economic impact scenarios, and the estimates of direct compliance cost.

A. History and Purpose of GLI

Intergovernmental cooperation involving the Great Lakes has a long history. The International Waterways Commission was formed in 1905 to advise the governments of Canada and the United States on water levels and flows in the Great Lakes. In 1909, the Boundary Waters Treaty between the United States and Canada was signed. This treaty founded the International Joint Commission (IJC) to resolve disputes over the use of water resources and to carry out studies and provide advice to the signatories.

Studies carried out by the IJC lead to the formulation of the 1972 Great Lakes Water Quality Agreement between the United States and Canada. This agreement aimed at protecting the Great Lakes from the effects of pollution through cooperation between the two countries. The focus of the agreement was the control of nutrient loadings to the lakes. It also provided for joint monitoring and surveillance programs coordinated through the IJC.

Continued research, including the results of these joint programs, identified problems caused by toxic pollutants in the Great Lakes. Based on this work, the Great Lakes Water Quality Agreement was amended in 1978 to expand its scope to include toxic pollutants. The agreement called for the virtual elimination of the discharge of persistent toxic chemicals and set targets for phosphorous loads to each lake. At the same time, the purview of the agreement was expanded to the entire Great Lakes ecosystem.

In 1987, the Great Lakes Water Quality Agreement was amended again, clarifying the roles of the U.S. and Canadian Governments, and the IJC. The governments' stated policy in the agreement is that:

- the discharge of toxic substances in toxic amounts be prohibited,
- the discharge of persistent toxic substances be virtually eliminated,

- a coordinated planning and management process be developed and implemented by each jurisdiction to ensure adequate control of all sources of pollutants

The agreement includes numerical and narrative water quality standards as minimums for the two countries. The agreement calls for the identification and elimination of Areas of Concern in the Great Lakes basin (Forty-two have since been identified.) Remedial Action Plans (RAPs) are to be developed and implemented to address the Areas of Concern, and Lakewide Area Management Plans (LAMPs) developed to address impairments in the uses of open and nearshore waters.

The purpose of the Great Lakes Water Quality Initiative was to establish uniform water quality standards within the Great Lakes basin and to use these standards in negotiating revised water quality objectives with the Canadian government under the Great Lakes Water Quality Agreement. The governors of the Great Lakes states, who began work on the initiative in 1989, believed that consistent water quality standards were necessary to reduce confusion and difficulty in regulating the discharge of toxic substances and reduce the possibility of "standard shopping" by industry looking to site a new facility.

The large number of people relying on the Great Lakes as a source of water supply, the threat of toxic contamination to industrial, commercial, and recreational uses of the lakes, and the long retention time for water passing through the lakes were cited as reasons for giving the lakes special protection.

In 1990, Congress passed the Great Lakes Critical Programs Act, which formalized the Great Lakes Water Quality Initiative The act identified key activities in the Great Lakes Water Quality Agreement between the U.S. and Canada, and imposed deadlines on the U.S. EPA for carrying out activities. The Critical Programs Act required the EPA to published proposed, uniform water quality guidance for the Great Lakes, which is consistent with the objectives of the Great Lakes Water Quality Agreement. The agency published the proposed Great Lakes Water Quality Guidance (Draft Guidance) in April 1993. It is this guidance that is the subject of this study.

B. What Can You Take From This Report?

1. The Economies of the Great Lakes States are Interdependent

DRI has identified the key industries and states that will be affected by the GLI. The economies of the Great Lakes states have strong inter-industry linkages, that do not respect state lines, and the economic system will spread these costs significantly. Certain states with few dischargers will nevertheless experience economic impacts ten times higher than the direct compliance costs incurred in that state. If the extreme scenario comes to pass, no state will escape the cost impact.

The effects of GLI implementation on employment, income, and industrial output are presented from variety of angles, to provide policy-relevant insights. To the extent that states have been perceived as "competing for jobs by offering more lenient environmental regulations," the GLI ensures that such differences will no longer exist and cannot be exploited to the detriment of the Lakes. However, unless the Guidance is modified to reduce regulatory uncertainty, it has the potential to erode the competitiveness of the

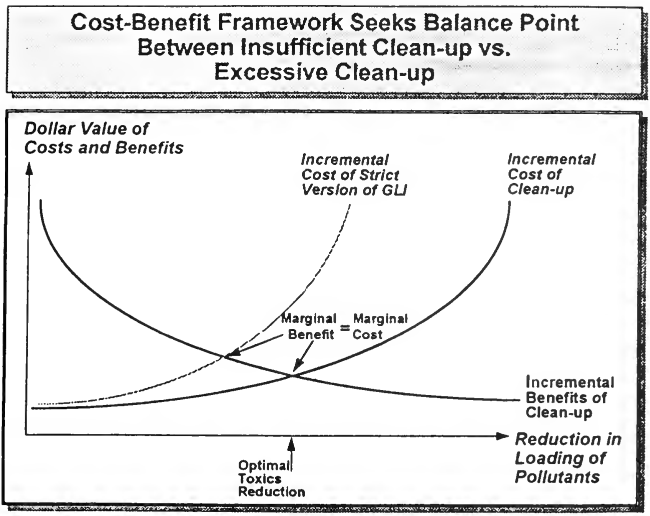
region's economy The impact on competitiveness, the specific industries and states that are threatened the most, and the possible remedies are all detailed in this report

2. The Role of an Efficiency Criterion in Environmental Regulation

This report takes the water quality goals of the GLI as given and points out those provisions of the Draft Guidance that are least cost-effective, and that could be modified without materially impairing benefits. This approach was chosen because the more rigorous cost-benefit framework was deemed impractical given the difficulties associated with valuing environmental benefits in dollars. The wide ranges of cost estimates presented in this report are daunting enough, yet the uncertainty surrounding valuation of benefits is far larger. Even so, changes in pollutant mass loadings *at the margin by GLI's water quality criteria* are sufficient to extract policy-relevant conclusions.

However, to put the discussion into perspective, it is useful to review the Cost-Benefit framework that underlies all conceptual work in this area. Central to this perspective is the concept of diminishing marginal returns. (See Exhibit I-1.)

Exhibit I-1



The earliest stages of environmental clean-up are generally easy to justify, since costs of simple remedial measures are low, and initial benefits are high. As greater and greater

reductions are achieved, it is generally at a higher cost, and at a lower marginal benefit. At some point, the marginal benefits will equal the costs, after which, incremental clean-up will actually yield lower benefits below the value of their cost.

DRI is not suggesting that the level of toxic chemicals in the Great Lakes Basin is currently near the "optimal toxic reduction" point shown in the figure. Rather, the message is that certain elements of the GLI appear to violate assumptions behind the upward sloping cost curve. The assumptions that are violated include:

- the cheapest pollution reduction measures will be tried first, and
- successive clean-up efforts will be sequenced according to the least-cost, or cost-effectiveness, principle.

Since GLI actually ignores the costs inherent in its implementation, it is represented by a radically sloped cost curve that intersects the benefits curve much sooner than necessary (see Exhibit I-1). An extreme example of such inefficiencies is that of ignoring the air pollution of coal-fired power plants, which contribute literally tons of mercury into the atmosphere each year, most of which finds its way into the Lakes. At the same time, the Draft Guidance requires expensive treatment technologies to be applied to the process waters, which contain amounts of mercury measured in micrograms.

3. The Three Least Cost-Effective Elements of GLI Are Identified

Three specific GLI policies have emerged from the analysis as having the greatest potential to generate costs without commensurate benefits:

- Lack of well-defined Intake Credits,
- Elimination of Mixing Zones for BCCs, and
- Adoption of an Anti-Degradation Policy.

In the case of intake credits, DRI has concluded that the EPA does not intend to force facilities using noncontact cooling water to treat these waters prior to discharging; however, the language in the Draft Guidance does not ensure this outcome. The costs associated with such treatment would be exorbitant, and yield no perceptible benefit to the environment. Slight alterations in the wording of the Guidance can remedy this deficiency.

The mixing zone and anti-degradation policies do yield some environmental benefits, but they can also lead to "cost spikes" that are out of proportion with potential benefits. These spikes can be avoided by applying intake credits for atmospheric deposition or a variety of market-oriented mechanisms, such as loadings reduction credit trading, multiple source total maximum daily loads (TMDLs), a better definition of "economic and social development," and "atmospheric deposition credits."

4. GLI Will Hurt the Competitiveness of Great Lakes States

If GLI is implemented in its current form, the "worst case" scenario suggests that up to 33,000 jobs could be lost, and Great Lakes residents would forego $1.9 billion in personal income. This cost impact would fall mainly in Michigan, New York, and Wisconsin. This distribution results from the economic structure of the Great Lakes Region: affected dischargers in Ohio, Michigan and Indiana will reduce their purchases of industrial

materials from the main industrial states. For this reason, states such as Illinois and Pennsylvania, despite the small number of affected dischargers, are significantly impacted by the GLI

In its current form, the GLI will be mandated only for dischargers in the Great Lakes Basin, which covers all of Michigan and only parts of the other seven states. However, many of these states are considering applying the GLI provisions state-wide, in which case the overall costs and benefits will be larger. While analyzing that possibility is not in the scope of this study, industry and state-specific multipliers provided in this report can be used by state officials and other interested parties to convert the compliance cost estimates from adjacent regions into total economic impacts with reasonable accuracy.

C. Regulatory Uncertainty Is a Cost in Itself

1. The Permit Process is Complex and Idiosyncratic--and Thus Unpredictable

All direct industrial and municipal dischargers into the Great Lakes Basin are required to obtain an NPDES permit,[1] which is generated by state environmental administrators[2] and subsequently reviewed by the U.S. EPA. Experts from state and federal agencies have disagreed on the impact of the GLI provisions on permits, largely due to the complexity of the process itself, and due to unresolved ambiguities in the text.

One indication of how difficult it is for outsiders to predict the impact of GLI on permits is the example of U.S. EPA's own cost study. The study was prepared by Science Applications International Corporation (SAIC), a respected consulting engineering firm specializing in analysis of environmental legislation and design of pollution control strategies.

The SAIC study reviewed 25 Michigan permits in their survey of Great Lakes dischargers, and in their "most likely" scenario estimated that immediate compliance costs, not including longer-term procedures,[3] would total $10.2 million. When the Michigan Department of Natural Resources reviewed these same permits, they concluded that *none* of the costs identified by SAIC would in fact be justified, since none of the permit limits would be affected. The main difference appears to have been caused by the treatment of hardness of the receiving waters, which affects the toxicity and thus the water quality criteria for certain metals.

Because Michigan's water quality criteria are already generally as strict or stricter than the proposed GLI criteria, the initial impact on dischargers in this state should indeed be relatively minor. But this example merely underscores the point that environmental professionals can genuinely take significantly different interpretations of the language in the Guidance. Since EPA officials must review and approve each NPDES permit, even the state permit-writers' interpretation is not final, so regulatory uncertainty clearly makes it difficult to project changes in permits. If environmental watchdog organizations or

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1 National Pollution Discharge Elimination System.

2 Referred to as DNRs, short for Departments of Environmental Resources, throughout this report.

3 Such as future elimination of mixing zones, lowering of detection limits or costs of anti-degradation restrictions.

dischargers believe that the final permit is to lenient or too strict, the potential for legal action adds yet another layer of uncertainty [4]

Thus, even dischargers with dedicated pollution control offices staffed by knowledgeable environmental engineers face huge hurdles in forecasting the effects of the GLI for their corporate management. Any prudent, risk-averse corporation will take this uncertainty into account when deciding on new investments, expansions, reductions, or shutdowns.

In light of this, any measure that makes the permit process more predictable, even if the outcome is slightly stricter, will on balance reduce the cost of doing business, and therefore make the region more competitive.

2. Estimates of GLI Costs and Benefits Have Wide Margins for Error

If costs end up in the lower end of a forecast range because permits do not turn out to be strongly affected by GLI, benefits will also be in low end of their range---and vice versa. The preceding example of the wide range of differences in predicting the costs of Michigan's compliance with GLI has an important corollary: where there are no compliance costs, because permits will not change, there will also be no loadings reductions, and therefore no benefits.

As a general rule, where we hope to realize the greatest loadings reductions, we must also expect to pay a significant cost. Interestingly, the GLI offers many instances of high costs with no "real" loadings reductions (for example, no intake credits for once-through cooling water) and low costs for significant loadings reductions (for example, direct-source pollution minimization programs, such as weekly mercury collection from dental offices rather than letting them pour it down the drains).

3. GLI Itself Will Only Marginally Improve "Standardization" Across States

One of the original rationales for the GLI was the perception among state officials that potential investors were engaged in "standards shopping"—searching among the states and building facilities where environmental standards were most lenient, thus rendering ineffective the stricter regulations of neighboring states. While the GLI will reduce this practice, states are still left with wide discretionary powers. DRI does not intend to suggest that, after GLI, some states will be effectively more stringent than others. But potential investors attempting to chose sites for industrial activities will still face a thicket of individual, highly idiosyncratic procedures for implementing these regulations.

GLI will have narrowed the *environmental outcomes* across states, but it will not appreciably reduce the *regulatory uncertainty* faced by U.S. firms attempting to adapt to a dynamically changing economic landscape.

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[4] While this section has focused mainly on the 3,000 direct dischargers in the region, the 7,000 facilities that discharge into municipal sewer systems (POTWs) also face an added layer of regulatory uncertainty: based on changes in the POTWs permit, through pre-treatment programs they may face reductions in their permitted loadings, or monetary charges for the POTWs treatment costs – a fourth layer of regulatory uncertainty.

D. DRI Scenario Descriptions Have Been Chosen to Highlight Policy Choices:

In its choice of scenarios to analyze, DRI has been guided by two criteria: the need to bracket the reasonable range of potential outcomes and the desire to appropriately emphasize the policy choices available, and their impacts.

1. DRI's Four Policy Scenarios

This DRI/McGraw-Hill study reports two distinct sets of cost estimates:

a. Policy Set A: Stringent Policies (no mixing zones, strict intake credits, etc.)

   i. *Scenario A-Low: Uncertain costs end up in low end of range*

   ii. *Scenario A-High: Uncertain costs end up in high end of range*

b. Policy Set B: Lenient Policies (mixing zones, easier intake credits, etc.)

   i. *Scenario B-Low: Uncertain costs end up in low end of range*

   ii. *Scenario B-High: Uncertain costs end up in high end of range*

Policy Set A represents our best estimate of the range of costs if GLI is implemented today; the stricter options are chosen where EPA has provided options in the Draft Guidance. Under this scenario, direct compliance costs range from $710 million to $2.3 billion annually.[5] The total economic impact, including indirect effects, will be to reduce personal income by between $480 million and $1.9 billion per year, and to eliminate from 8,600 to 33,000 potential jobs.[6]

Policy Set B presents the cost consequences of adjusting the GLI to clarify intent and/or eliminate cost-ineffective provisions. These steps include:

- Lenient interpretation of Intake Credits,
- Allow Mixing Zones for Mercury (or equivalent), and
- Soften or re-define Anti-Degradation Policy.

These policy changes, or their equivalent, will reduce the compliance costs of GLI to a range between $60 million and $380 million per year. Between 750 and 5,400 jobs would be eliminated, and the total economic impact in terms of lost manufacturing output ranges from $110 million to $800 million per year (see Exhibit I-2).

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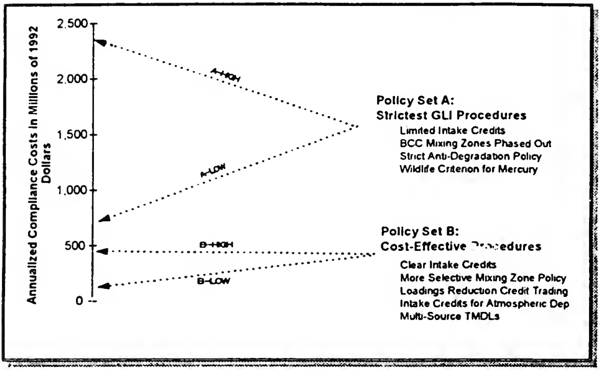
5 These costs are based primarily on an analysis of the EPA cost study and reports received from trade association studies, all of which are detailed in the first half of Chapter IV.

6 Note that, over this period, the region is expected to gain over 3,780,000 jobs. In this context, the loss from Scenario A-High is only slightly less than one percent of the projected employment growth in the region. While some portion of this loss represents jobs that will be eliminated, most of the effect will be expressed as a slower rate of creation of new jobs.

Exhibit I-2

GLI Compliance Cost Estimates for Four DRI Scenarios



2. EPA Cost Study Scenarios #2 and #3

In order to facilitate computations of equivalent total impacts on the Great Lakes Region, DRI has also simulated the two most relevant scenarios provided by the EPA.

The EPA cost estimates, prepared by SAIC in 1993, were presented as four scenarios, highlighting the varying impact of assumptions about how GLI changes would be applied to individual permits. EPA considers Scenario #2 the "most likely" scenario. In the expectation that the EPA estimates will be of continuing interest to students of GLI, DRI has used those estimates as the basis for a series of simulations on the DRI Regional Model.

This methodology effectively converts the EPA assumptions regarding compliance costs into estimates of the total economic impact on employment, income, and competitiveness. While DRI believes EPA's cost findings are optimistic, the assumption behind their Scenario #3 -- that POTWs may not be able to pass all treatment limits onto their indirect dischargers, necessitating a more aggressive treatment POTW treatment program -- is plausible. Therefore, we have also reported this scenario in Appendix B, for comparison purposes.

3. Each DRI Policy Set Has a High and a Low Scenario

Due to remaining regulatory and technological uncertainty, the total range of uncertainty in these cost estimates remains large DRI believes that a focus on achieving balanced implementation, especially in the three policy areas noted above, will reduce the range of uncertainty We also believe that achieving this balance represents one of the most important goals for policy makers As a consequence, these policies will be analyzed in detail throughout the chapters that follow.

II. Cost Effectiveness Can Be Achieved With Minimal Loss of Benefits

In this chapter, we examine ways in which the GLI can be made more cost-effective. We also give a more fully developed picture of the uncertainties surrounding the GLI and of ways to deal with these uncertainties Finally, we explore the impact on the Great Lakes Region's industrial competitiveness.

Given the uncertainties arising from the initiative, the Council should proceed with caution In general, the regulatory approach reflected in the GLI works better when the costs and benefits are more precisely quantifiable. The wide range of projected costs and the complexity of forecasting the effect of the Guidance on facilities increase the range of uncertainty. Technological uncertainty surrounding GLI is also high. It is difficult to foresee the extent to which facilities will be able to comply with the initiative by means of low cost measures or will instead be required to utilize high-cost treatment technologies.

Despite all this uncertainty, the risks to policy makers, including the Council of Great Lakes Governors, are fairly clear The following two risks are chief among them:

- The public may easily be oversold on the GLI. The initiative will not solve even half "the problem" in the Great Lakes because toxic substances covered by the Guidance account for only one-half of the pollution and the Guidance addresses only point-source contributions. Point-source pollution itself represents far less than half of total loadings. Certainly, if the public is oversold on the potential of GLI and it does not deliver, the result could be a public backlash on environmental policies in general.
- In its present form, GLI will negatively impact the industrial competitiveness of the Great Lakes Region This is not a simple case of "business never likes regulation," but, again, one of cost-effectiveness: are losses of this magnitude in terms of industrial output, jobs, and income necessary for the region to get the benefits of improved water quality? DRI's believes that they are not.

These risks can be managed through changes to the GLI implementation procedures. Three GLI measures have the greatest potential to generate costs without commensurate benefits:

- lack of well-defined intake credits,
- elimination of mixing zones for contaminants, and
- adoption of an anti-degradation policy.

In this chapter, we suggest ways of changing the GLI to address its shortcomings in these areas. We also explore measures relating to mercury criteria, detection limits, and potential contaminants.

A. Regulatory and Technological Uncertainty: Proceed with Caution

One of DRI's goals in this study was, through technical analysis, to narrow the range of cost estimates in order to improve the basis for policy making on the Great Lakes Water Quality Initiative (GLI) During the course of the study, new studies have increased the range of cost estimates quoted in p ɔlic, the worst-case scenarios now portray annual compliance costs in the tens of billions of dollars. Meanwhile the DRI study has narrowed the estimated range considerably

Despite these new studies and DRI's efforts to associate costs with various policy mixes, considerable uncertainty remains. This uncertainty stems from the very nature of the GLI process. The uncertainty surrounding the GLI can be usefully divided into *regulatory uncertainty* and *technological uncertainty*.

The term regulatory uncertainty describes the inability of permitted dischargers, legislators, state permitting authorities and even the U.S. EPA to predict the impact of GLI on permit limits. For example, the EPA cost study's detailed review of 25 Michigan facilities was completely reversed by an equally detailed review conducted by the Michigan Department of Natural Resources. Similarly, widely differing interpretations of the impact of GLI emerged when the U.S. EPA and the eight state Departments of Natural Resources (DNRs) were requested to submit estimates of changes in permits for three hypothetical facilities.

This uncertainty is driven by the complexities and built-in ambiguities of the permit process. Given these characteristics, it should come as no surprise that managers of private and public facilities have great difficulty forecasting the impact of GLI on their permit limits.

Technological uncertainty compounds the regulatory uncertainty. It is nearly impossible to predict the degrees to which industry will be able to meet GLI limits through cost-effective means (such as waste minimization studies and earlier investment in process changes that were inevitable) or through expensive end-of-pipe treatment technologies. The EPA cost study was quite optimistic on this score, predicting that nearly all loadings reductions could be achieved by small adjustments in materials or procedures used, and that dischargers would seldom resort to expensive treatment. However, given the steep reductions in loadings that will be required once analytic detection methods have improved and mixing zones have been eliminated, the plausibility of the EPA's treatment assumptions breaks down. Such issues are the main reasons for technological uncertainty.

1. GLI: Old Fashioned Approach to Regulation

Such uncertainties can be frustrating and may even prompt questioning of the benefit of economic analysis in this context. However, DRI believes that genuine uncertainties should be acknowledged so that strategies can be developed to deal with them:

- First, the regulatory uncertainty is a problem in its own right, and should be addressed by eliminating ambiguities and streamlining procedures in the Guidance itself; DRI has recommended specific changes along these lines.

- Second, policy makers should proceed with caution when outcomes are this uncertain. The projected benefits of GLI are modest, yet the costs are potentially significant. Adopting a more flexible policy that immediately implements the known cost-effective solutions, while aggressively investigating areas of uncertainty, is preferable and places no unnecessary burdens on the economy. For example, establishing market-based incentives for loadings reductions, such as credit trading schemes and cost-based regulations, ensures progress without risking "cost spikes."

The "command and control" regulatory style employed by the U.S. EPA for GLI is better suited to situations where costs and benefits are more precisely quantifiable and there is consensus on goals and on the means of obtaining them.

The federal government and the public want concrete action now to improve the Great Lakes, and they will surely be pleased with effective action in the form of market-based, site-specific, risk-prioritized approaches. Genuine ecosystem approaches, such as the Lakewide Area Management Plans (LAMPs),[1] represent the latest thinking in environmental regulation---inside and outside U.S. EPA---and constitute genuine improvement over the water quality based approach embedded in the GLI. While water quality criteria are a vital defense against environmental degradation, such criteria are already in force in existing federal standards. The issues here are how much beyond federal standards the Great Lakes states go to improve the lakes, and what methods should be used to achieve this higher standard.

2. GLI Alone Can't Do the Job

Another reason to proceed with caution is that much remains to be done in the water quality arena, and expectations must be managed accordingly. If the public and their non-technical policy makers believe that by supporting GLI they will solve "half the problem" in the Great Lakes, they will be deceived. Toxic substances covered in the GLI are only one of many classes of problems facing the lakes, and point-source contributions of even those substances represent far less than half of the total loadings.

There is considerable risk of backlash after the public accepts the economic costs and elected officials accept the political costs involved and later hear of additional sacrifices to pay for items such as reducing mercury emissions from coal-fired power plants, or altering agricultural practices to reduce pesticide run-off. Ironically, because these strategies have not been pursued with vigor to date, the first round of elimination of these pollutants would likely be *far more cost-effective* than most of the GLI provisions selected by DRI for reconsideration.[2]

Exhibit II-1 illustrates the impact of the GLI on the main beneficial uses associated with the Great Lakes and their tributaries. DRI has used the chart below to justify the

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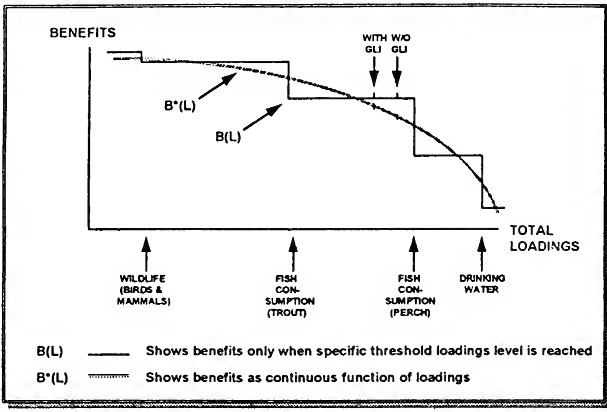
1 Discussed in Chapter 5 Section E.

2 See Figure I-1, which illustrates the principle that the first rounds of pollutant reductions are generally easily considered worthwhile — only when the incremental value of benefits begins to approach costs do the truly difficult choices need to be made.

treatment of loadings reductions as a benefit in and of themselves, even where no clear change in uses is directly caused by the adoption of the Guidance. The rationale is that, in a dynamically changing policy environment, it is impossible to predict how successful the states and the EPA will be in reducing non-point source pollutants, which are the main contributors to impaired use of water bodies in the Great Lakes Basin today. However, assuming that significant progress can be made, it is possible that the point-source reductions will contribute just enough to the total reduction to "push us over the edge," and achieve an improved level of beneficial uses.

Exhibit II-1

GLI Alone Will Not Reduce Loadings Enough to Eliminate Fish Consumption Advisories



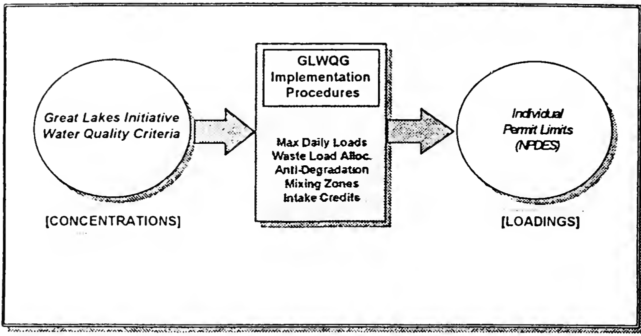
This argument is valid, but the fact remains that if point sources are responsible for only 10% of the loadings reductions, but constitute 40% of the total cost, and *if that same level of clean-up could have been achieved at significantly lower cost by another means*, the public will have been ill-served.

B. Some Implementation Procedures Don't Make Sense

Most states in the Great Lakes region can claim that their water quality criteria are nearly as stringent as the GLI criteria. If this were the whole story, then incremental benefits and costs of GLI would be nominal, and the main accomplishment would be a common standard, which is a worthy goal in its own right.

Exhibit II-2

Role of Implementation Procedures



However, as Exhibit II-2 illustrates, water quality criteria establish maximum pollutant concentrations, while *implementation procedures* must be used to derive individual permit limits. Implementation procedures vary considerably from state to state, and by adopting procedures that are generally as strict or stricter than the strictest states, the GLI represents a quantum jump in regulatory severity for most states.

1. Advantages and Disadvantages of Specific Implementation Procedures

DRI has taken as given the GLI objectives to reduce toxic chemicals in the Great Lakes Basin to levels that will be harmless to humans, wildlife and aquatic life. This report seeks to answer a specific question: does the Draft Guidance, released April 16, 1993, achieve that objective in the most cost-effective manner?

DRI's most conservative (that is, highest) estimate of annualized compliance costs under Scenario B is $2.3 billion, while the highest estimate for Scenario B is $380 million. The difference underlying these two estimates is the treatment of three key implementation procedures embodied in GLI:

- Intake Credits,
- Elimination of Mixing Zones for BCCs, and
- Anti-Degradation Policy.

Materials provided to DRI, primarily by industry-sponsored trade associations, have enabled us to distinguish, to some degree, the cost implications of these three policies.

a. Intake Credits Should be Expanded

While the term "intake credits" is not used in the Draft Guidance, the concept generally means the degree to which permit-writers will take into account toxins present in the discharge that were not added by the discharger. This issue is most clearly highlighted in the case of "once-through cooling water," used in many industries, including electric utilities and steel mills. For toxins such as mercury, whose background concentrations currently exceed the water quality criteria, environmental administrators do not want to be placed in the position of mandating clean-up of the lakes by filtering lake waters—a Herculean and extremely cost-ineffective task. Clearly, industry would find the prospect equally unappealing.

In the Guidance, the procedures covering "waste load allocations" and "reasonable potential to exceed water quality standards"[3] are the sections that are most relevant to the question of intake credits. After examining these sections in light of submissions by trade associations, DRI has concluded that industry has justifiable fears: strict interpretation of the Guidance could force them to apply end-of-pipe treatment technologies to their cooling waters. Officials of state Departments of Natural Resources (DNRs) have indicated that, in such a situation, they would not impose a total maximum daily limit (TMDL) because they could not demonstrate a "reasonable potential to exceed water quality standards."

However, Procedure 5 [Reasonable Potential] states that a facility must demonstrate that it:

- *E. 1.b. does not contribute any additional mass of the identified intake water pollutant to its wastewater; and*
- *E.1.d. does not increase the identified intake water pollutant concentration at the edge of the mixing zone, or at the point of discharge if a mixing zone is not allowed, as compared to the pollutant concentration in the intake water.*[4]

Specifically, since many facilities use a copper-based algaecide in their cooling waters, permit holders are concerned that, given a strict reading of the Guidance, state agencies could face third-party legal action if they find "no reasonable potential" under these circumstances. Similarly, since cooling waters are subject to evaporation, concentrations of pollutants in water re-entering the lake waters will be higher than those in the lake waters; a strict reading of the Guidance suggests that this would constitute a violation.

Several of the reports that DRI received, notably from the Utilities Water Act Group, cited costs due to clean-up of cooling waters that, in the aggregate, would bring the annual compliance costs into the tens of billions of dollars. These costs were not included in any of the scenarios because DRI is confident that the EPA would not knowingly launch

3 Procedures 3 and 5 of Appendix F in the Draft Guidance.

4 GLWQG Unofficial Prepublication Copy / March 31, 1993, Page 303 [Appendix F, Procedure 5.E.1.].

a regulation that could force this outcome. A small portion of those costs, representing the "borderline" cases, have been incorporated in Scenario B-High.

Regulators could considerably reduce the level of uncertainty experienced by industrial dischargers by clarifying the language of Procedure 5. The clarification should unambiguously provide that discharges should not be responsible for pollutants that they did not add to the water body. Roughly 40% of the difference between DRI's Scenarios A and B could be eliminated by modifying the language in the GLI accordingly.[5]

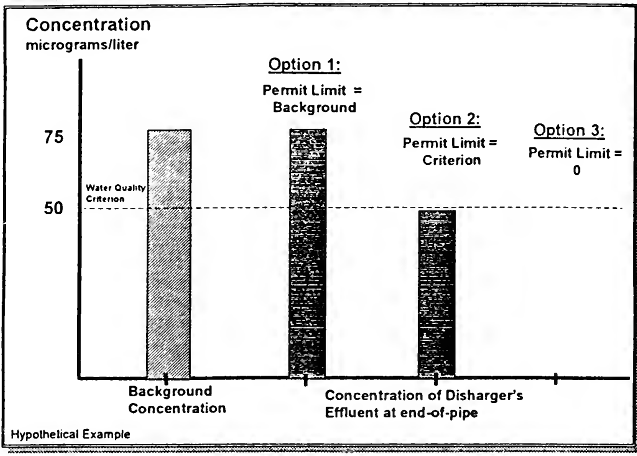
A more subtle issue regarding intake credits is raised by the language of the Draft Guidance. When the background concentration of a particular pollutant exceeds the water quality criterion, and the facility uses that pollutant in its process, should the discharger be required to clean up the pollutants that were already present in the lake water?

[5] In fact, there is some danger that, without some modifications in the language of the Draft Guidelines, the cost of GLI could far exceed the $2.3 billion estimate in Scenario A-High (some utilities have estimated this could raise electricity costs by 30%). This would take place if electric utilities and other major users of non-contact cooling water were forced to install cooling towers or recycle these waters in order to comply with interpretations of the GLI that do not accept the need for intake credits. DRI did not include these figures in the four scenarios, because of our belief that EPA would not promulgate guidelines whose clear intent was to force costly actions with such environmentally low payoffs. However, for the record, it is important that we state here the consequences of such an outcome.

Exhibit II-3

Intake Credits Make Sense

Dischargers Should Not Be Forced to Remove Pollution Caused by Others



A numerical example, as shown in Exhibit II-3, will illustrate this point. Suppose the background concentration of a toxin *x* is 75 µg/l, and the water quality criterion is 50 µg/l. The facility uses *x* in its process, and if it discharged its waters untreated, the concentration of *x* would exceed 75 µg/l. If the facility is assigned a negative waste load allocation (WLA), then it will be forced to remove *not only the toxins it introduces, but also some of the toxins that were already in the intake waters.*

A sensible approach to intake credits suggests that dischargers should only be responsible for toxins they themselves are potentially introducing into the ecosystem.

b. Elimination of Mixing Zones for BCCs

Mixing zones allow dischargers to exceed chronic water quality criteria at the end of their discharge pipes,[6] while ensuring that within a certain distance from the outfall pipe (or in

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6 Dischargers are still prevented from discharging above *acute* water quality criteria, however.

some states following a certain time period after discharge) the discharge will have been diluted by the receiving waters sufficiently to meet chronic water quality criteria.

Bioaccumulative Contaminants of Concern (BCCs) are recognized as a special hazard to the Great Lakes ecosystem. Given this, the Draft Guidance presents arguments that loadings for BCCs should be reduced by whatever means possible, even where this means becoming more stringent than the water quality criteria. The effect of eliminating mixing zones will be a reduction in loadings of BCCs of up to 75%, depending on the dilution factor previously allowed for each facility.

This raises a question as to whether the GLI is aimed at "virtual elimination" of BCCs or at reaching the water quality criteria. The Guidance is currently ambiguous on this issue, and there are associated cost implications.

While this policy will undoubtedly reduce loadings for BCCs, it is not clear that the additional loadings reduction could not be obtained much more cost-effectively from other sources. It represents a rather crude tool for achieving the reductions, without taking into account whether site-specific health or wildlife considerations are involved, nor whether benefits will be commensurate with compliance costs.

DRI estimates that this provision accounts for some 25% of the cost difference between Scenarios A and B. Possible remedies include allowing mixing zones for BCCs, implementing multiple source TMDLs (so that mixing zones are only eliminated in cases where point sources are the predominant source of the BCC), credit trading, or atmospheric deposition credits.

c. Anti-Degradation Policy Needs More Flexibility

Since many states have already implemented anti-degradation policies, the GLI anti-degradation policy is more an attempt to standardize procedure across states than a brand-new procedure. Essentially, it ensures that facilities will not decrease water quality by adding toxins, even where such addition would still meet the water quality criteria and/or permit limits. It establishes the principle that water quality criteria are not a ceiling under which facilities are free to maximize their discharges; rather, existing water quality, if it is better than the criteria, acts as a ceiling, and prevents further degradation.

One of the great strengths of the GLI anti-degradation policy is the introduction of the *de minimus* provision. Essentially, if a discharger can show that the additional lowering of water quality represents 10% or less of the available assimilative capacity, the additional discharge will be allowed. This is an example of the kind of flexibility that lowers administrative costs for both regulators and dischargers, and, by making the actions of regulators more predictable, lowers the costs of regulatory uncertainty.

However, one major source of regulatory uncertainty is not addressed by the Draft Guidance: the demonstration of *important social or economic development.* [7]. This provision empowers the head of the state environmental agency to consider degradation of water quality due to "employment, financial or social services contributions." State

[7] Defined in Appendix E, Section IIID of GLI Draft Guidance

environmental administrators have stated that local input in such determinations tends to view the loss of a single job or even minimal loss of income as grounds for suspending the anti-degradation policy.

This creates a situation in which the final decision will be reached by an arbitrary method, and communities will employ increasing ingenuity in pleading their cases. Far more preferable would be an economic cost/benefit-based criterion, incorporating site-specific risk-based analysis, thereby allowing dischargers and permit-writers to predict with greater certainty under what conditions a waiver would be granted. Nevertheless, the *Social or Economic Development Demonstration* is one of the few examples of building flexibility into the GLI using economic cost as a criterion. Thus, the intent here is not to criticize this effort, but to suggest that it be made more detailed and specific.

The anti-degradation policy, as written, will tend to inhibit the dynamic process of facility shut-down and start-up that naturally characterizes efficient economic systems. For the industries most directly affected by GLI, Exhibit II-4 shows projected annual growth rates through 2015. Roughly half of this growth can generally be met through expansion of existing facilities, the other half will most likely come from establishment of new facilities. To the extent that the anti-degradation policy inhibits this process, it represents a foregone economic opportunity—a very real cost.

DRI estimates that growth-inhibiting aspects of the anti-degradation policy are responsible for 35% of the cost gap between Policy Sets A and B. The anti-degradation policy itself should not be eliminated, but there is a clear need for a better defined economic development exception. In addition, this is an ideal opportunity to permit an evolution from dirtier to cleaner processes by introducing a credit trading scheme.

Exhibit II-4

Growth Rates of Key Great Lakes Industries

Sector	Projected Annual Growth Rate 2000 - 2010	Projected Output Growth 2000 - 2010 Millions of 1992 $
Food & Products	1.2%	17,968
Paper & Allied Prod	1.3%	7,232
Print & Publishing	1.8%	17,003
Chemicals	1.7%	17,842
Primary Metals	-0.8%	-4,581
Non-Elec Machinery	2.6%	46,979
Elec. Machinery	2.4%	25,590
Transportation Equip.	2.3%	56,507

2. Other Factors Causing Reduced Cost-Effectiveness

a. Mercury is a "Cost Trigger"

Meeting the mercury criteria appears to be the single most difficult task imposed by the GLI. Aside from dioxin, which is a by-product of some paper mill and certain combustion processes, none of the other BCCs responsible for impaired use of the Lakes is commonly used in industrial processes. Mercury, however, is a prevalent substance in industrial, commercial, and residential use, and has significant natural sources as well.[8]

An examination of the EPA Technical Background Document[9] to the cost study reveals that mercury limits were assumed to be stricter under GLI for 21 of the 50 facilities in the EPA sample, including five of the eight POTWs.[10] All but two of these facilities are expected to require some form of treatment, which suggests that current loadings are at or above the allowable loadings under GLI given current analytical detection methods. Over

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8 The mercury criterion has been set so low, at 180 picograms per liter, that it is possible that this level is actually *below* the levels found in nature before humans came to America.

9 SAIC, Technical Background Document for the Great Lakes Water Quality Guidance Implementation Procedures Compliance Cost Study, April 16, 1993.

10 Also, in a sample of 36 permits reviewed by the Ohio EPA, 22 were found to contain mercury in their permits, 13 of which were POTWs.

30% of the attributable compliance costs are attributed to mercury, making it the single highest cost pollutant in the sample

Furthermore, two factors will inevitably drive the costs attributable to mercury even higher First, mercury is the only BCC currently in widespread use, and therefore it is virtually certain that the elimination of mixing zones for BCCs within ten years will drive up the costs for mercury controls the most. Second, mercury is one of four GLI chemicals that must meet the wildlife criteria, which are currently five orders of magnitude lower than current EPA-designated detection limits. When GLI becomes effective, facilities will only be required to bring effluent concentrations in line with current detection limits, and *already* they are the largest single attributable cost of GLI. Once detection methods improve, permit limits will inexorably decline, driving up costs exponentially.

Without a doubt, regulators should provide dischargers, particularly POTWs, strong incentives to remove mercury. Because its use is so widespread, a number of inexpensive pollution prevention options for achieving initial loadings reductions exist and should be exploited However, reducing mercury loadings to 1/10,000 of their already regulated levels will certainly be expensive and may in fact be technically impossible.

There are several measures that could mitigate the mercury "cost trigger" problem. While most of these measures involve adjustments to existing GLI procedures, DRI is recommending a novel approach as well: "intake credits for atmospheric deposition."

Municipal sewer districts face a unique problem in that much of the mercury, PCBs and banned pesticides (such as DDT) present in their discharge are due to atmospheric deposition that washes these substances into the sewer system. These substances are essentially "background" pollutants over which the POTW has no control, in the sense that, even if the cities of Milwaukee, Detroit, or Erie had never been inhabited, the same amounts of mercury and other deposited substances would have made their way into the Great Lakes. In keeping with the principle that municipalities should not be required to treat wastes they did not generate, especially when it may trigger an inappropriately expensive treatment program, they should be granted credits for these substances similar to the intake credit policies discussed above.

Great Lakes officials should review whether basing permits on the wildlife criterion is a reasonable goal in view of its high cost and the fact that point sources account for at most 10% of the total mercury loadings. While setting a less stringent criterion would delay the drive towards virtual elimination, loadings data suggest that raising the mercury criterion by a factor of ten would not jeopardize our ability to remove mercury from the list of substances causing fish advisories.[11]

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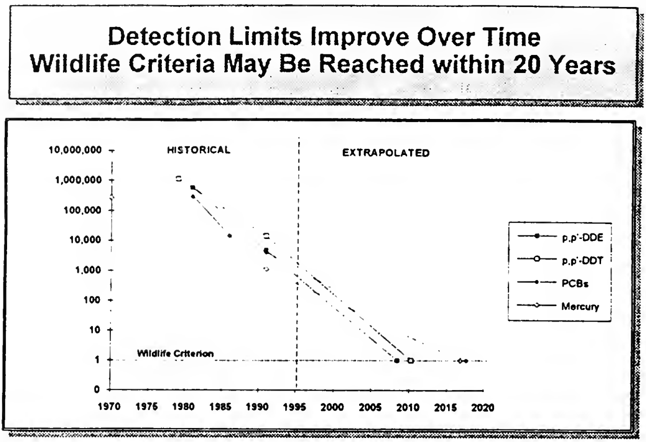
[11] A less crude approach to protecting the environment while ensuring that costs are not unnecessarily high would be to target what scientists suspect is the only biologically active form of mercury: methyl mercury. Because there is still some debate about the fate of other forms of mercury that enter the ecosystem, at present it is premature to recommend that the mercury criterion be replaced with a methyl mercury standard -- however, the Guidelines should be flexible enough to allow conversion to this form of mercury if and when scientific evidence supports this change.

Finally, allowing for multiple source TMDLs, as discussed in Chapter I, also raises the permissible loadings by a factor of ten, until such time as non-point source contributions have been successfully reduced, and the relative source contribution of point sources begins to climb

b. Detection Limits Will Improve Over Time

One of the leading discrepancies between the EPA's cost estimates and those of industry arises from the treatment of detection levels. Assuming that dischargers will not be required to reduce their discharges below *current* detection limits suggests that, indeed, the burden on dischargers would not be severe. However, detection limits have in fact improved over time, and if recent trends continue, the extremely low concentrations for wildlife criteria will be measurable and therefore mandated by the year 2015, well within the time frame of this study. (See Exhibit II-5.)

Exhibit II-5



Thus, one of the major premises behind the argument that GLWQI will not significantly change permit limits appears to be valid only over the near-term. Over the medium term, dischargers will have to meet a moving target, and within a decade or two, the actual criteria will be the driving force behind costs.

c. Potential BCCs

There are 10 compounds included in the Draft Guidance as potential BCCs. They would be classified as BCCs if the Bio-Accumulation Factor (BAF) is revised upward, and all 10

are considered to be close to this borderline at this time. Several of these compounds, such as phenol, toluene, and the polycyclical aromatic hydrocarbons (of which benzo[a]pyrene is one), are present in the petroleum refining process. If these compounds are classified as BCCs, with the attendant elimination of mixing zones and other consequences, additional compliance costs not estimated in this report would be borne by dischargers

d. Tier II Values

The GLI establishes *tier I criteria* for 37 substances[12] whose potential to cause harm to humans or wildlife is relatively well-understood. An additional 101 substances may eventually qualify as Tier I substances, but at present the environmental data on these chemicals is insufficient to allow the Tier I procedures to be applied. The EPA proposes that conservative criteria, to be known as Tier II values, be imposed until such time as Tier I criteria can be developed.[13] Under the proposal, permit holders wishing to increase their permit limits would bear the cost burden of developing the Tier I criteria, and EPA estimates that this development process will cost at least $120,000 per substance.

Since the potential Tier II values have not been finalized, and because for many of these substances very little information is available about the possible presence of these substances in discharges, this report does not evaluate the potential costs. However, allowing industry to initiate the scientific research to establish more lenient values is an innovative solution to the problem that dischargers should not bear the cost of bureaucratic delays on the part of EPA as it decides how much money to allocate to the criteria development process, and which substances are worth analyzing first. The approach is conservative, and EPA expects that industry trade associations will pool their resources to ensure that no individual discharger bears an unreasonable burden.

C. Choices Available to Policy Makers:

1. Provide Flexibility Where Point Sources Are Marginal Contributors to Lake-Wide Concentrations

Among the key conclusions of this report is that, for those GLI pollutants that are most responsible for impairing the lakes, point sources generally account for far less than half of the total loadings.[14] Other important sources include contaminated sediments, atmospheric deposition, and leaking waste sites. In addition, loadings from Canada are unaffected by this legislation. GLI is officially "source-blind," in that it applies to any U.S.-based pollution source but currently is only binding on regulated water pollution sources. Thus, most sources of atmospheric deposition, sediments, and many leaking waste sites will remain unaffected until GLI II, while point sources will be affected, in some cases dramatically.

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12 GLI covers 138 substances in total (28 BCCs, 10 potential BCCs, and 100 non-BCCs), but only a subset have criteria to date.

13 EPA expects that in most cases the eventual tier I criteria will be more lenient.

14 Dioxin is the only exception to this statement. See Chapter V for details.

EPA officials have stated that there is no harm in allowing point sources to absorb the brunt of the burden initially, because they are confident that other sources will be addressed in relatively short order. However, this strategy gives rise to two dangers

- The first danger is that with a water quality based regulation such as GLI, if one class of permit-holders is reviewed before another class, they will always bear a disproportionate share of the clean-up burden. Stricter water quality criteria will reduce or eliminate the available loadings, so the point-source discharger will find his permit sharply reduced or eliminated. In contrast, an approach that requires facilities contributing 20% of the pollution to be responsible for 20% of the reductions would be viewed as more **fair**. Also, from an economic viewpoint, it would be more **efficient** to target reductions where they are most cost-effective, and work up the "cost curve" to the point where the desired level of loadings reduction is achieved Since NPDES permit holders have already been regulated for more than a decade, and have already adopted the "easier" methods of loadings reductions, it is likely that initial reductions in non-point sources will turn out to be more cost-effective. The water quality based regulatory approach embodied in the GLI provides neither the fairness nor efficiency in the sense discussed above.
- The second danger is that, unless the public has an accurate impression of the role of point-source discharges, the GLI runs the risk of being "oversold." When the public discovers that those expenditures only address a small part of the problem, there may be a backlash against strict environmental standards. Such a backlash would hamper the difficult steps necessary for a truly comprehensive solution.

These dangers could be averted by drafting GLI provisions that explicitly address the potential balance between point source and non-point source loadings. One such provision, hinted at but not explained in the Draft Guidance,[15] would incorporate a "multiple source" TMDL. While the Guidance do not spell out the meaning of this term, the implication that each source would be allotted loadings proportional to its contribution is encouraging.

A more challenging but ultimately more rewarding path would be to alter the fundamental approach embodied in the GLI to adhere more closely with the Lake-wide Area Management Plans (LAMPs). These plans develop solutions customized to individual lakes, whose characteristics differ widely. These plans also provide the flexibility to determine the source of each pollutant and target the reduction strategy to the most cost-effective reduction methods. While LAMPs may lack the dramatic sweep of the GLI, they do offer a greater likelihood of addressing the most serious problems first, while avoiding the costly and ineffective anomalies in the GLI.

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[15] Appendix F, Procedure 3A. C 4. and 3B, C. 3 states:
"In cases where background concentrations exceed criteria or values, WLAs shall be set equal to zero or a multiple source TMDL shall be established that ensures attainment of criteria or values and control of BCCs pursuant to section B of this procedure." [underlining added]

2. Define Stricter Definition of Social or Economic Need as Applied in Anti-degradation Policy.

The Anti-Degradation Policy as described in the Draft Guidance is vague on the criteria to be used in deciding the elements of a successful *Social or Economic Development Demonstration,* which can be used to relax the anti-degradation constraints. Since a dynamic economy requires some existing plants to expand and some to be replaced by newer plants, maximum clarity and predictability on this point is vital. This is especially true given that newer processes are generally designed with stringent environmental restrictions in mind. As written, the anti-degradation policy is not a mechanism that encourages the replacement of older, dirtier processes with more modern, clean ones.

A more explicit set of criteria for determining the precise nature of the trade-off between social or economic needs, on the one hand, and environmental concern on the other, would alleviate this problem to some degree.[16] A site-specific, analysis of costs versus benefits using a sample methodology provided by U.S. EPA would be the ideal criterion.

3. Allow Trading of Loadings Reduction Credits.

Air pollution emissions reduction credits have been advocated by economists for several decades as a means of employing a market-based approach to reducing pollution. Over the past several years, such schemes have been implemented nationally and in several states. These schemes promote efficiency by allowing plants with high emissions-reduction costs to "under-comply" with pollution reduction goals, as long as other plants, with lower marginal costs, make up the difference. The result is that overall emissions abatement goals are met[17] at a lower overall cost to the economy.

Water pollution has generally been considered a less viable candidate for trading credits, since most conventional water pollutants, such as nutrients, are generally highly site-specific, and trading even between facilities that are as little as 10 miles apart would be counterproductive. However, in the case of GLI there is an opportunity, explained immediately below, that has not been widely recognized.

There are two types of problems associated with toxic pollutants:

Situation "A"	Site-specific "hot-spots" where local exceedances pose risks to humans, wildlife, or aquatic life, and
Situation "B"	Lake-wide or even basin-wide accumulation of loadings that find their way into fish tissue and bioaccumulate up the food chain.

In Situation A, the trading of credits *among facilities that use the same outfall pipe* will be effective, and this is exactly the case in municipal sewer districts. POTWs can use credit schemes to encourage their indirect dischargers to reduce their joint costs by

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16 Point 3 in this list, "trading of loadings reduction credits," addresses this problem even more directly.

17 In fact, some programs include a x:1 offset (where x>1) such that facilities must buy up x units of emissions reduction from other plants for every additional unit they emit — thus the environment benefits each time a transaction takes place.

meeting an aggregate loadings reduction goal, this is possible and practical because indirect dischargers have widely divergent cost-effectiveness.[18]

Since much of the emphasis in the GLI is on Situation B, the scope for trading credits is actually quite large In general, the risks associated with pollutants such as mercury are lake-wide, therefore, the basic remedy is to control total loadings.

Using a credit trading scheme to reduce total loadings would help minimize the economic impact of the criteria themselves Also, using an offset ratio of 2:1 would generate benefits similar to those anticipated from the anti-degradation policy and the elimination of mixing zones. The potential cost reduction could range from 20% to 50% of the total economic impact of GLI.

4. Extend Life of Permits From Five to Ten Years.

The possibility of doubling the period during which NPDES permits remain valid has already been discussed informally. This would reduce regulatory uncertainty for the regulated community and reduce the administrative burden on state agencies. Assuming that the 10-year permit life did not take effect until the first round of permit renewals incorporating GLI restrictions took effect (we are assuming 1997-2003), the only environmental benefits at risk would be the changes in detection limits. Although DRI has not analyzed the costs and benefits of this proposal in detail, the trade-off between reduced regulatory uncertainty and slower reductions in pollutant loadings appears reasonable.

5. During the Permit Process, Devote More Attention to Collecting and Analyzing the Economic Characteristics of Dischargers.

In the course of conducting this study, the data-gathering implications of the 1960's-style environmental regulations were made apparent. For example, the team utilized the EPA Permit Compliance System, a "comprehensive" data base containing hundreds of variables covering each NPDES facility in the region. Despite millions of pieces of data, regulators have no way to link the establishments' environmental characteristics, such as effluent flow and loadings, to economic characteristics, such as number of employees, plant capacity, or value of output.

Until regulators can readily access and analyze this kind of data, they will be unable to anticipate the economic impact of new policies on the regulated community.

D. Impact of the GLI Standards on Regional Competitiveness

1. Major Impact on the Region's Competitiveness if Initiative is Adopted in its Most Stringent Form.

In the strict sense of the term, the Great Lakes Region can *afford* the Great Lakes Water Quality Initiative. The goals of standardizing across the states, strengthening our

[18] The EPA cost study reports incremental cost-effectiveness (in $/lb.-equivalent removed of toxic and non-conventional pollutants) ranging from $1.39 for pharmaceuticals to $559.94 in the electronics industry. See page 4-9, Table 4-5 of SAIC, 1993.

negotiating position with Canada, and nearly eliminating dioxin and a few other toxic chemicals are worthy goals, and area residents and their progeny will benefit.

If the annual costs can be brought as low as $100 million, it is clearly worth doing Even if the costs run as high as $2 billion, despite some localized displacement effects and lost jobs, the impact on the average pocket book would be only $23 per year, (see Exhibit II-6 and, by most criteria that is *affordable*.

Exhibit II-6

Putting the Economic Impact into Perspective

Costs of GLI Relative to Great Lakes Economy For the Year 2005

	Scenarios			
	B-Low	B-High	A-Low	A-High
Percentage Loss in Manufacturing Output (Relative to Base)	0.008%	0.057%	0.088%	0.337%
Percentage Loss in Personal Income (Relative to Base)	0.002%	0.016%	0.024%	0.094%
Loss in Personal Income per Resident (1992 dollars)	$0.55	$3.90	$5.91	$22.95

However, good policies are not just affordable, they are also cost-effective, and they should nudge society closer to its stated goal without the loss of significant resources. As currently written, the GLI is not cost-effective, and there are strong indications that a newer generation of regulations, reflecting market-based mechanisms, featuring genuine ecosystem approaches, and building on the Lakewide Area Management Plans would be more effective solutions in the long run.

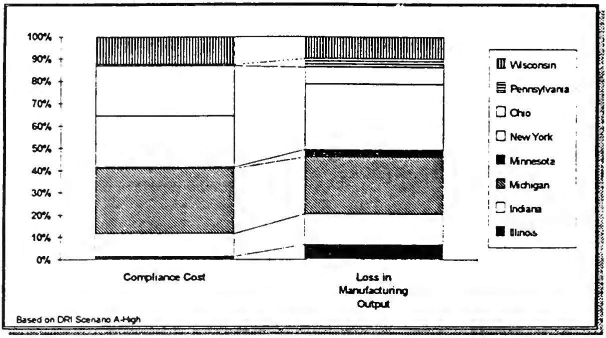
Alone, the Initiative will not cripple the Region's ability to compete in the global economy. Rather, it will represent one more nick in the Region's competitiveness, and in the context of the dozens of similarly inefficient policy packages that are considered in these states each year, adopting one will not impact competitiveness, but adopting three or four each year will make itself felt.

The DRI Great Lakes Regional Model reveals that even states with low compliance costs will not escape the impact of GLI if other states are hit with high costs. Exhibit II-7 shows this to be especially relevant to Minnesota, Illinois and Pennsylvania.

Stephen Meyer recently set out to determine the cost in terms of economic growth and competitiveness of strict environmental standards across the US, and was surprised to discover that those states with the highest environmental quality were generally the fastest growing ones. He found that "if environmentalism does have negative economic effects they are so marginal and transient that they are completely lost in the background noise of much more powerful domestic and international economic influences."[19]

Exhibit II-7

States' Shares of Compliance Costs Do Not Match Final Economic Impact



This finding is consistent with the framework embodied in Exhibit I-1, in which the first efforts toward pollution reduction (perhaps corresponding to the period from 1968-1981

19 Meyer, Stephen, M., "Environmentalism and Economic Prosperity: Testing the Environmental Impact Hypothesis," October, 1992, Dept. of Political Science, Massachusetts Institute of Technology, page 42. A second paper released in February 1993 determined that the positive correlation was due to a third, confounding variable (the degree to which individual states are concentrated in extractive industries), and concluded that economic growth and environmental effort were essentially causally unrelated. Another potential explanation, consistent with DRI's findings, is that states that first embrace higher compliance costs are best able to "export" them to other states. However, as the region over which the regulation apply grows, it becomes more difficult to shift the burden of environmental regulation.

in the US) have low costs and high benefits. This framework suggests that, as society approaches the "optimal" toxics reduction point, choices become harder, and the potential to hamper economic growth rises unnecessarily. A researcher working at the macro level in the year 2020 will be unable to isolate the impact of GLI even if the "worst case" cost scenario prevails But states with well-designed, cost-effective regulations will find themselves at the top of Professor Meyer's list of states with enhanced environmental quality *and* economic prosperity

III. The Permitting Process is Complex and Unpredictable

Among the studies conducted by the US EPA, private industry, and environmental groups that served as raw materials for this report, there is a disturbingly large range of estimates and forecasts of the costs and benefits of the GLI. Although DRI has narrowed the range of estimates considerably, one of the persistent factors that has maintained the gap has been the unpredictability of the permit process itself.

Because our analysis of costs and benefits, contained in Chapters IV and V respectively, depend on our assumptions regarding GLI's impact on permits, this chapter will first review the basics of the permit process, and highlight the aspects that drive the uncertainties.

The main policy conclusion of this analysis is that the lack of transparency in the permit process is itself a cost — although it is difficult to measure directly, it does impact economic behavior. Measures designed to reduce the uncertainty and improve predictability for permit holders will reduce the regulatory burden on regional competitiveness.

The GLI works in two directions in this regard: on the one hand, by standardizing procedures across states, it reduces the complexity of the process; however, since many of the provisions detailed below enhance uncertainty, the GLI has reduced the ability of industrial and municipal permit-holders to predict their costs of compliance, and this is a serious drawback in itself. If living with this type of regulatory uncertainty were necessary to achieve tangible, significant improvements in beneficial uses of the Lakes, the cost would be worthwhile, but as will be argued in Chapter V, the benefits are surprisingly modest.

A. Why the Permit Process is so Complex

The permitting process involves a large number of factors, which vary from state to state. Ambient water quality criteria and implementation procedures, the means by which water quality criteria are translated into permit limits, are the two major areas responsible for this variability. In both areas, the federal government provides guidance, but states are allowed some degree of latitude in establishing their programs.

Water quality criteria are developed to protect bodies of water for various uses and to protect the health of various species. Numerical criteria are intended to protect human health, aquatic life, and fish-consuming wildlife. For aquatic life, criteria are developed to protect against acute (short-term) exposures to high pollutant concentrations and chronic (long-term) exposures to lower concentrations. Criteria to protect human health are developed to minimize the risks of contracting cancer, as well as to protect against non-cancerous health disorders.

Implementation procedures define how the permit authority considers various factors when calculating the allowable discharge of pollution (or wasteload allocation) from a facility. These factors include items such as the stream dilution flow and the background concentration of a pollutant in the receiving water. Because allowable dilution flows vary with the water quality criterion to be met, wasteload allocations are calculated for each of the relevant water quality criteria, and the most stringent becomes the permit limit.

Current EPA guidance for deriving wasteload allocations is based on the following equation:

$$WLA = \frac{WQC[Q_d + (1-f)Q_e] - C_b Q_d}{Q_e} X$$

WLA = waste load allocation, mass/ time

WQC = water quality criterion, mass/ volume

Q_d = dilution flow, volume / time

f = fraction of effluent flow from receiving water

Q_e = effluent flow, volume / time

C_b = background concentration in receiving water, mass/ volume

X = factor to convert concentration limit to mass loading limit volume / time

For a sample facility taking all of its water from the same body of water into which it discharges, the WLA depends on the water quality criterion to be met and the dilution flow used in the calculation. Both of these parameters vary among the Great Lakes states, which represents one source of the complexity and variability of the permit process.

The WLA calculation shown above may not, however, actually become the basis for the permit limit for several reasons: technology-based effluent limits may be more stringent, anti-degradation regulations may apply, or the calculated permit limit may be below the lowest detection limits for approved analytical methods for the pollutant.

B. Factors that Increase Permit Stringency

1. Technology Based Limits

Water quality regulations that require specific control technologies have been promulgated for many industries. In situations where the effluent quality yielded by the required technology is better than the water quality based effluent limit, the technology-based limit applies. Therefore, comparisons of calculated WLAs alone do not reveal how discharges may vary from state to state.

2. Anti-Degradation Policies

The term "degradation" in its most general sense refers to the lowering of existing water quality. Anti-degradation policies are intended to counter this effect for waters that already meet their designated uses.

The current national anti-degradation policy takes a tiered approach:

- The first tier applies to all waters. It states that all existing uses of a water body and the level of water quality necessary to protect those uses must be

maintained and protected In other words, water quality can be lowered only to the extent that all existing uses are protected and maintained.

- The second tier applies to high-quality waters—those that are fishable and swimmable, in which limited degradation may be allowable if necessary for social and economic development, but only after public involvement and only if the waters remain fishable and swimmable.
- The third tier applies to Outstanding National Resource Waters, the quality of which must be maintained and protected. Lowering of water quality is allowed only for some temporary activities.

The national anti-degradation policy establishes a minimum that all states must meet. However, states can and do adopt anti-degradation policies that are more stringent than the national policy. This, too, contributes to the differences among permit limits for various states. As with the technology-based permit limits, anti-degradation may override the permit limit established using the WLA procedure. Thus, anti-degradation policies must also be considered when comparing permit limits among different states.

3. The Issue of Detection Limits

The calculated WLA and corresponding limits on the concentration of a pollutant in an effluent may also not apply as a permit because the calculated limit is less than standard analytical detection limits can achieve. In this situation, two states may calculate different permit limits, but if both are below the analytical detection limit, the permit limit would be designated as non-detectable in both cases. In effect, the enforceable permit limits are the same. However, it is likely that in the future, as analytical methods become ever more sensitive, the detection limits will approach many of the water quality criteria that are now below detection. (See section B.4., following.) Permit limits that today are effectively equal because they are given as non-detectable may not be in the future.

In summary, ambient water quality criteria and wasteload allocation determinations alone do not represent a sufficient basis for comparing existing state water pollution control programs for point source discharges. The other factors described above, and, perhaps equally important, the interpretation by permit writers of their state's regulations and policies, can have an overwhelming effect on the limits written into the permit.

Given their complexity, state permitting polices and procedures are rarely transparent to those outside office writing the permits for the state. For this reason, the exercise requested by Senator Levin, in which each of the Great Lakes states would calculate permit limits using their existing procedures represents the best comparison of how facilities are currently regulated.

The results of this exercise and a comparison of the state permit limits with those calculated by the U.S. EPA based on the GLWQG are discussed in depth in Chapter V.

4. Improvements in Detection Limits Will Lead to Stricter Permit Limits

The ambient water quality standards for many of the pollutants addressed by the Great Lakes Water Quality Guidance (GLWQG) are below the corresponding analytical detection limits. This is especially true for the chemicals for which water quality standards

intended to protect wildlife have been established, it is also true for many other bioaccumulative chemicals of concern (BCCs) considered to be carcinogens.

In situations where calculated permit limits are lower than analytical detection limits, the permit limit is typically designated as "non-detectable" based on a specified analytical method. As analytical methods improve, we expect their use to be required in new permits or when existing permits are renewed. Thus, while the permit limits may remain as "non-detectable," the definition of non-detectable becomes more stringent over time.

Exhibit III-1 illustrates the trend in detection limits for three of the four chemicals for which the GLWQG establishes criteria to protect wildlife. The 1991 values are the limits given in the Pennsylvania Code for accepted EPA analytical methods, and the earlier detection limits are taken from studies of water quality in the Great Lakes.

Exhibit III-1

Reported Detection Limits, µg/l

Year	Compound				
	Unspecified	p,p'-DDE	p,p'-DDT	PCBs	Mercury
late 1950's	50,000				
1970-1971					50
1979			1		
1981		0.5		5	
1986				0.24	
1991		0.004	0.012	0.068-0.8	0.2
GLWQG Wildlife Criteria		8.7×10^{-7}	8.7×10^{-7}	1.7×10^{-5}	1.8×10^{-4}

Source: The Conservation Foundation of Washington, DC; Environment Canada/Department of Fisheries and Oceans/Health and Welfare Canada; Commonwealth of Pennsylvania Code

In the late 1950's, 50 parts per million (ppm) (50,000 µg/l) was considered to be effectively zero given the analytical techniques of the time. Today, standard analytical techniques yield detection limits six orders of magnitude lower. Furthermore, with more sophisticated analytical methods, larger sample sizes, or an absence of interfering substances in the sample, detection limits can be much lower than those of standard methods.

Given the foregoing, we expect detection limits—and thus permit limits—to decrease significantly in the future, possibly to the extent that the detection limit will be below the calculated permit limit.

IV. The Economic Impact of Complying With the Great Lakes Water Quality Initiative

This chapter presents findings regarding the costs of GLI for the Great Lakes states, including estimates of ***direct compliance costs***, an accounting of ***indirect effects***, and an evaluation of the ***overall economic impact on output, employment and income***. The compliance cost estimates are based primarily on the US EPA cost study, conducted by Science Applications International Corporation, and a number of engineering studies commissioned by industry trade associations. The total economic impact was derived from DRI's Model of the Great Lakes Economy, an econometric model built specifically for this study.

DRI's estimate of the direct compliance costs attributed to the GLI will range between $710 million and $2.3 billion per year. This range reflects two types of uncertainty, technological and regulatory, both of which are addressed in this chapter. Three specific GLI Implementation Procedures are identified as cost drivers, along with the wildlife criterion for mercury. If these provisions are modified, the study finds that the annual compliance cost range could fall to between $60 million and $380 million.

The study assumes that GLI will begin to affect permits starting in 1997, and that by the year 2003, more than 90% of permits will reflect GLI limits. If so, by the year 2005, the "worst case scenario" (A-High) will lead to the loss of $1.9 billion in personal income, 33,000 jobs, and $4.7 billion in manufacturing output compared to the DRI model's base case.

The economic system works to spread such costs, through inter-industry and inter-state linkages, so no single industry or state is forecast to register a severe shock. However, to the extent that much of that cost can be avoided without meaningfully changing its environmental impact, the GLI currently does not meet the criterion of cost-effectiveness

We start with a summary of the main conclusions regarding costs, followed by an analysis of compliance cost estimates. The method used for converting these estimates into economic impact is explained, followed by a detailed presentation of the effect of GLI on the economy and competitiveness.

A. DRI Findings: The Economic Impact of GLI

DRI's estimates of annual compliance costs for GLI range from $64 million to $2.3 billion. These estimates are based on an analysis of the EPA cost study[1] and several studies released by industry trade associations. While the sum of the high-end estimates of the industry studies runs into the tens of billions of dollars, DRI has incorporated only those estimates that appear to be well-supported with engineering analysis and plausible in view

1 "Assessment of Compliance Costs Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance," SAIC, April 16, 1993.

of the language and intent of the Draft Guidance The economic consequences of the fou DRJ scenarios are summarized in Exhibit IV-1

Exhibit IV-1

Summary of Economic Impact Analysis
(Millions of 1992 Dollars)

In the Year 2005	Scenarios			
	B-Low	B-High	A-Low	A-High
Direct Compliance Cost	59	381	709	2,286
Loss in Personal Income	43	319	484	1,880
Loss in Manufaclunng Output	111	795	1,222	4,694
Employment Loss (# of Jobs)	745	5,402	8,649	33,230

To account for regulatory and technological uncertainty, we have grouped the cost estimates into four scenarios that can be used to evaluate the impact of specific policy actions on the cost-effectiveness of GLI. These compliance cost estimates, along with estimates from two of EPA's scenarios, have been run through DRI's Model of the Great Lakes Economy, to derive the indirect economic impacts of the scenarios.

The main conclusions of this chapter are:

- Direct costs for **GLI compliance could run as high as $2.3 billion per year.** This would occur if high-cost implementation procedures are left in the Guidance, and if dischargers are not successful in finding innovative, low-cost solutions to loadings reduction requirements.
- **Policy makers could cut costs by as much as 80%** by providing clear, lenient language on intake credits, and either eliminating the mixing zone and anti-degradation policies, or adopting flexible, market-based provisions that mitigate the most costly potential effects of those policies.
- By the year 2005, the **"worst-case" scenario (A-High) could lead to the loss of $1.9 billion in personal income**, 33,000 jobs, and $4,700 billion in manufacturing output in the eight Great Lakes States. New York and Michigan together would absorb over half of the loss in income, followed by Wisconsin and Indiana.

- Despite the low number of affected dischargers in Pennsylvania and Minnesota, these states will lose $8 in personal income for every $1 in direct compliance costs, due to their economic interdependence on the other Great Lakes states. This effect is slightly less powerful in Illinois, which faces a 3.1 ratio. The overall lesson is that **no state will escape the costs of GLI** because of the strong linkages inherent in modern manufacturing.
- Although these figures appear high, they represent a tiny fraction of the Great Lakes Economy, and would be imperceptible in the aggregate even if the "worst case" scenario came to pass. In the worst case, the employment and personal income losses amount to less than 0.1% of their base values, and manufacturing output losses are no more than 0.34% of total industrial output. Because the sectors affected are capital intensive, and compliance costs are lump sum costs, most industries will "take the hit" without generating the large layoffs that would be associated with a tax of similar magnitude. **The loss in personal income will average $23 per resident in the worst case, or as low as 52¢ per resident if the Guidance is made more lenient** and technological factors work in our favor.
- Clearly, the residents of the Great Lakes States can afford to pay the price of point-source reductions. However **efficiency and fairness suggest that the bulk of that $2.3 billion can and should be saved**; the impact on reductions in toxic chemical loadings into the Lakes would be imperceptible and could be compensated for through aggressive regulation of non-point sources.

This study goes beyond the EPA cost study in explicitly accounting for indirect economic impacts and for implementation procedures such as anti-degradation, mixing zone elimination and detection limits; however, other GLI provisions have received less scrutiny by DRI and other researchers. These gaps in our knowledge include the additivity restrictions, and treatment of Tier II values and potential BCCs.

B. EPA and Industry Trade Association Estimates Vary Widely

As noted, Science Applications International Corporation (SAIC) conducted a study on the cost of industry compliance with the GLI for the U.S. Environmental Protection Agency (EPA).[2] In addition, various industry trade groups have also studied the costs of compliance for their specific industries.

The cost estimates produced by the SAIC and industry trade association studies vary widely. The SAIC study puts the annual cost of industry compliance with the GLI in the $50 to $500 million range---a range that clearly reflects the above-mentioned uncertainties surrounding the GLI standards. Taken collectively, the trade association estimates reviewed for this study put the annual compliance cost in the $1 to $2 billion dollar range (see Exhibit IV-2)

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2 Science Applications International Corporation, April 16, 1993, *Assessment of Compliance Costs Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance.*

Exhibit IV-2

Comparison of SAIC and Trade Association Estimates of Annual Compliance Costs

(Millions of 1992 Dollars)

Sector	SAIC Estimates			Trade Association Estimates	
	Low	*Medium*	*High*	*Low or Expected*	*High*
Pulp & Paper	10	17	27	302	302
Chemicals				23	133
Petroleum	17	32	35	44	112
Metals Manufacturing	1	2	2	n.a.	n.a.
Iron & Steel	n.a.	n.a.	n.a.	15	400
Metal Finishing	2	3	4	n.a.	n.a.
Electric Utilities	1	2	3	33	493
Misc.	44	95	81	40	91
POTWs	5	41	353	252	756
Total	80	192	505	709	2286

With estimates varying by a factor of four to 20 times, one may well ask why the variation is so wide. The study by SAIC and those by the trade associations assume similar technologies and costs for treating effluents. Therefore, the wide disparity in estimates reflects differences in assumptions regarding the number of plants, the amount of effluent needing waste removal, and the cleanup technologies themselves.

For example, the pulp and paper industry study contends that nearly all mills will need sophisticated cleanup facilities. Their study reasons that, given background concentrations of mercury that in many cases now exceed the GLI limit, the small amount contributed by a typical pulp and paper mill would almost always violate the standard. However, in certain cases SAIC judged that, in light of the extremely small size of the mercury exceedances, paper mills and some other plants would satisfy the mercury standard by means of relatively inexpensive pollution minimization techniques rather than expensive end-of-pipe treatment facilities.

In addition, some of the trade association studies we reviewed infer costs for a full universe of plants on the basis of very small samples of respondents. This makes the results vulnerable to self-selection bias. For instance, the Chemical Manufacturers Association (CMA) developed industry-wide estimates by scaling up the results of a

sample of only eight out of 95 plants in the Great Lakes basin In developing the industry-wide costs, they assumed that non-respondents have compliance costs similar to those of respondents. However, it could be that the CMA received responses only from plants facing high costs and that the non-respondents anticipated minimal costs and thus did not bother to respond to the survey due to lack of interest.

The SAIC estimates assume compliance with the initial set of GLI Guidance, which allow mixing zones for bioaccumulative chemicals of concern (BCCs). Also, SAIC estimates costs by considering compliance only for the 34 chemicals that have explicit Tier I limits. On the basis of the available documentation, it appears that the lower values (the expected or optimistic values) reported in the various trade association studies usually reflect similar assumptions regarding compliance (that is, compliance with the initial GLI Guidance for the 34 chemicals that have explicit Tier I limits). The more pessimistic values presented in each trade association study typically assume more restrictive standards; these in some cases include no mixing zones, and the mandated use of end-of-pipe treatment for even small deviations from standards. Furthermore, the cost-estimation procedures sometimes incorporate Tier II standards for some compounds.

Neither the SAIC nor industry studies consider future industrial developments in detail, and therefore do not explore the effects on new or expanding plants. The estimates from these sources consider only present facilities and effluent flows. However, new facilities will be built and many existing facilities will be expanded, giving rise to new and larger wastewater flows. These new sources of pollution will need to comply immediately with the GLI limits without mixing zones for BCCs. They also will need to comply immediately with anti-degradation standards. These factors will raise compliance costs for new plants relative to those of existing plants.

On the other hand, new plants will benefit from older plants going through the experience of learning to remove pollutants economically. Also, the new plants should be able to structurally incorporate the cleanup processes in a convenient and economical manner, whereas older plants must make do with retrofitting. Thus, one can make a case for either higher or lower costs for new plants. Our estimates of overall regional costs assume that new and expanding facilities will face the same costs as current facilities.

C. Estimates for Specific Industries Vary

Below we present estimates for five major industries that would be impacted significantly by the GLI.

- Pulp and Paper
- Chemicals
- Petroleum
- Iron and Steel
- Electric Utilities.

A short discussion of costs affecting the automotive industry is also included. Other industries will be affected as well, but engineering studies detailing the likely costs for these industries are not yet available. A conservative procedure for incorporating the costs of these industries is described in Section E of this chapter.

1. Pulp and Paper Industry

A study sponsored by the National Council of the Paper Industry for Air and Stream Improvement (NCASI) estimates that the GLI would cost the pulp and paper industry about $450 million (1992 dollars) annually (see Exhibit IV-3).[3] About $150 million of this total, however, represents costs that publicly owned treatment works (POTWs) would incur and charge back to the pulp and paper mills. To avoid double counting, we treat these costs as part of the POTW total estimated below rather than as a separate charge to the pulp and paper industry.

Excluding these POTW expenses, the NCASI study suggests that the GLI would cost the pulp and paper industry about $300 million annually. Note, however, that many states are considering the application of GLI standards state-wide, not just in the Great Lakes basin. If the estimate includes pulp and paper mills outside the basin for all eight states, the annual cost swells to about $1 billion, including associated POTW charges, and to about $750 million annually excluding those costs.

Exhibit IV-3

NCASI Estimates of Costs of Complying with the GLI Guidelines

Treatment or Processing Option	Mills in the Great Lakes Basin			Mills in the States		
	Direct	*Indirect*	*Total*	*Direct*	*Indirect*	*Total*
Controlling mercury and other effluents at end of pipe	242	116	358	604	169	773
Recycling mills closing of process water	49	12	61	94	22	116
Bleaching mills converting processing	9	18	27	48	18	66
Monitoring	2	0	2	4	1	5
Total	302	146	448	750	210	960

Source: *Preliminary Estimated Costs to the Pulp and Paper Industry Due to the Great Lakes Water Quality Initiative*. National Council of the Paper Industry for Air and Stream Improvement, Inc.(NCASI), December 8, 1992

As indicated in the chart above, the NCASI estimates include costs for:

- controlling mercury and other effluents at end of pipe,

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[3] See *Preliminary Estimated Costs to the Pulp and Paper Industry Due to the Great Lakes Water Quality Initiative*. National Council of the Paper Industry for Air and Stream Improvement, Inc., December 8, 1992. This study also draws on *Projected Impact of the Great Lakes Water Quality Initiative on Four Paper Mills* and *Potential Treatability Options and Associated Costs for Low Levels of Mercury*, EA Engineering, Science and Technology, September 1992 and October 1990.

- closing process water systems at recycling mills,
- converting processing at bleached chemical pulp mills, and
- monitoring effluents.

While the first category above refers to end-of-pipe treatment, the second and third represent process changes that recycling mills and bleached chemica' pulp mills would typically implement in preference to end-of-pipe treatment. The final category refers to monitoring for compliance with the standards. The estimates consider process water only, and the study assumes that non-contact streams, such as cooling water, would not contribute to costs.

Each of these four measures warrants more detailed examination:

a. Controlling Mercury and Other Effluents.

About 80 per cent of the paper and pulp industry's costs arise from the assumed joint use of granulated activated carbon (GAC) and ion exchange (IE) processes applied to the effluent stream either at the mills themselves or at associated POTWs. For most directly discharging mills, the severe limits placed on mercury dictate the need for this end-of-pipe treatment. Background mercury levels typically exceed the GLI limits. However, the *furnish* (raw materials) used i. the pulp and paper manufacturing process typically contributes some mercury to the effluent stream. Thus, even with intake credits, the study assumes that most mills would need to treat their effluent.

The assumed treatment technology reflects a study by EA Engineering, Science and Technology (EA) on removing low level mercury contamination. In this study, EA concluded that only the joint use of the GAC and IE processes currently holds much promise for reducing mercury to the GLI limits. Nonetheless, the NCASI report describes the assumed cleanup technologies as illustrating feasible, but not necessarily the best or cheapest, methods for each mill.

The cost estimates for GAC and IE derive from EPA cost curves approximated by the following formulas:

$$C_{GAC} = .27 \cdot Q^{48}$$
$$C_{IE} = 1.0 \cdot Q^{84}$$

in which C denotes annual cost in millions of dollars and Q the treated effluent flow in millions of gallons per day.

For direct dischargers, the cost numbers derive from applying the formulas above to effluent volume. For indirect dischargers, the estimates assume that POTWs will install the treatment facilities and charge the costs to customers based on effluent flow. NCASI estimates that pulp and paper indirect dischargers contribute about 20 per cent of the total flow to their POTWs and thus will be responsible for about 20 per cent of their POTWs' clean-up costs.

Closing Water Systems at Recycling Mills. The NCASI study assumes that most paper recycling mills will eliminate effluent discharges by recycling the process water rather than treating an effluent at the end of the discharge pipe. In particular, the study assumes that

all direct- discharging de-inking mills and all other recycling mills, both direct and indirect dischargers, would invest in water system closure. The study assumes that indirect-discharging de-inking mills will find it cheaper to pay their share of POTW costs.

The treatment technology involves treating the internal process water with biological and physical-chemical methods to make it usable back in the paper manufacturing process. At the end of the water purification process, one obtains a small concentrated stream that is allowed to evaporate, leaving behind a solid that is disposed of by landfill. The study assumes that the costs of processing internal recycled water in de-inking mills would be four times that of other mills. This reflects the greater processing required to make water recyclable in de-inking mills.

b. Converting Processing at Bleached Chemical Pulp Mills.

NCASI assumes that bleached kraft mills will change their manufacturing processes to use chemical bleaches and other materials that will permit levels of BCCs to fall within the GLI limits. In particular, NCASI assumes that bleached kraft mills will incorporate oxygen delignification and complete substitution of chlorine dioxide for chlorine in the first bleach stage and that hypochlorite stages will be eliminated. The kraft mill estimates include costs for upgrading chemical recovery capacity. Sulfite mill modifications assume changes only in the bleaching area.

c. Monitoring Effluents.

These estimates reflect assumptions concerning the compounds that would have to be monitored, the analytical or biological methods that would be used in each case, and the laboratory costs for each method. The laboratory cost estimates come from a survey conducted by NCASI.

2. Chemical Industry

A study commissioned by the Chemical Manufacturers Association (CMA) estimates that the GLI would cost chemical manufacturers about $45 million annually (1992 dollars).[4] This estimate includes only plants that discharge wastewater within the Great Lakes basin; it does not include costs that would result from applying the GLI Guidance to plants outside the basin within a state. However, the estimate combines costs of direct and indirect dischargers, each computed on the basis of the same treatment and cost assumptions. The SAIC study suggests that about half of all chemical plants in the basin are indirect dischargers. Thus, as much as 50 per cent of the CMA figure might also be included in estimates for POTWs.

The estimates are derived from a survey conducted by Tischler/Kocurek. The survey collected information on compliance costs from a sample of six of the 95 CMA member plants that: (i) are located on one of the Great Lakes or a tributary, and (ii) discharge wastewater. The survey asks for compliance costs corresponding to five different cases. The initial three cases vary the compounds that are assumed to be subject to GLI limits.

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4 *Compliance Cost Survey for the Great Lakes Water Quality Intitiative*, report prepared by Tischler/Kocurek for the Chemical Manufacturers Association (CMA), September 1992.

Case 1 includes only those chemicals for which the EPA has already established explicit limits Case 2 adds more bioaccumulative compounds that current estimation procedures suggest would also qualify as BCCs subject to limitations Case 3 adds some non-bioaccumulative chemicals. Cases 4 and 5 establish upper limits to costs by assuming, respectively, treatment of non-contact cooling water, if it violates GLI Guidance, and treatment of all discharges

With the exception of Case 5, the costs don't differ much across the scenarios. Thus, the CMA applies the results of Case 3 in estimating relationships that are used to determine an expected value and an upper-bound (90 per cent confidence limit) for overall industry costs.

Expected Value Formulas

Unit Capital Costs = $12.94\ e^{-.735Q}$

Unit O&M Costs = $1.41\ e^{-.543Q}$

Upper Bound Formulas

Unit Capital Costs = $33.4\ e^{-.735Q}$

Unit O&M Costs = $6.52\ e^{-.543Q}$

In the above cost equations, effluent flow (Q) is in millions of gallons per day, and the unit costs are in dollars per gallons per day for capital and annual dollars per gallon per day for operations and maintenance (O&M). Using a 10 per cent fixed charge rate to annualize capital costs obtained by these formulas, the survey suggests that the chemical industry's annual cost of compliance would probably be about $45 million, with an upper limit of $133 million (see Exhibit IV-4)

3. Petroleum Industry

Compliance with the GLI would cost petroleum refiners in the Great Lakes basin between $44 and $112 million (1992 dollars) annually, according to the results of a survey sponsored by the Ohio Petroleum Council (OPC).[5] The low-end estimate assumes limitations only for the EPA's current list of BCCs with explicit standards and that the facility could increase the concentration by the amount of the limitation ("net limits" with intake credits). A variety of middle-range estimates assume, alternatively, net and end-of-pipe limits (no credits or mixing zones) and progressively larger numbers of compounds subject to limitations. The upper-bound estimate assumes treatment of all facility effluents, including non-contact cooling water.

The survey collected data from four of the eight plants accounting for 83 per cent of the refinery capacity in the Great Lakes basin. Thus, the upper cost estimate above grosses up the upper bound estimate for the four reporting refineries by 20 per cent, whereas the lower estimate assumes both the low estimate for the four reporting refineries and no costs for the non-respondents. While the survey asked that indirect discharges be treated as requiring the same cleanup (at POTWs) as direct discharges, none of the reporting

5 *Summary of the Ohio Petroleum Council Survey on the Impact of the Great Lakes Water Quality Initiative on the Petroleum Industry*, prepared for the Ohio Petroleum Council by ERM-Midwest, Inc., January 1993.

refineries discharged to POTWs Thus, the cost estimates here appear to involve no double counting with POTWs

Exhibit IV-4

CMA Estimates of the Costs of Compliance with the GLI

State	Number of Plants Affected	Expected Annual Cost (Millions of 1992 Dollars)	Upper Bound Annual Cost (Millions of 1992 Dollars)
Illinois	0	0.0	0.0
Indiana	10	6.5	25.2
Michigan	30	9.7	36.6
Minnesota	1	9.7	3.2
New York	19	4.4	16.3
Ohio	24	10.6	39.5
Pennsylvania	1	0.9	3.5
Wisconsin	10	2.7	10.4
Total	95	44.6	133.1

4. Iron and Steel Industry

Compliance with the GLI would cost a new 400,000 ton per month integrated steel mill between zero and $26 million (1992 dollars) annually, according to a study sponsored by the American Iron and Steel Institute(AISI).[6] Expanding these estimates to all major dischargers in the steel industry, the AISI results suggest that the industry faces annual costs of $30 to $400 million dollars annually. The low estimate assumes intake credits and compliance with the limits established just for those 34 compounds with explicit Tier I criteria. The high estimate assumes no intake credits, not even for the blowdown from non-contact cooling water, and compliance with Tier II criteria for Benzo(a)pyrene (BaP).

These values derive from a range of estimates of compliance costs relative to the alternative of satisfying the more lenient EPA Best Available Technology (BAT) standards. Specifically, the study presents estimates for the costs of complying with:

- existing state standards for a site in Ohio and a site in Indiana,

[6] American Iron and Steel Institute Great Lakes Water Quality Initiative Study, The Chester Engineers, September 1992.

- GLI standards with intake credits and only current Tier I limitation on top of the state standards for each of the two sites.
- GLI standards without intake credits on top of the state standards at the Indiana site.
- GLI standards including limits on BaP on top of the state standards at the Indiana site, and
- GLI standards without intake credits and including limits on BaP on top of the state standards at the Indiana site.

For Ohio, the study suggests that complying with the existing standards would cost about $10.6 million annually. Under the most optimistic scenario for GLI (current Tier I limits and intake credits), the cost expands to $13.1 million annually, which represents a $2.5 million increment. For Indiana, the study finds that complying with the existing standards would cost about $17.2 million annually. Under the most optimistic scenario for GLI, the costs do not change. However, under less optimistic assumptions, they rise substantially. In the most pessimistic case, costs reach $43 million annually, or an increment of $26 million over the costs of complying with existing state standards.

The estimates reflect conceptual plans for new integrated mills at particular sites in Ohio and Indiana. The cost estimates differ for those two locations, because of differences not only in state standards regulating effluents but also in background concentrations.

5. Electric Utilities

The cots for the utility industry in the Great Lakes basin to comply with the GLI would range from just under $500 million (1992 dollars) annually, assuming intake credits make it unnecessary to treat non-contact cooling water, to as much as $3.4 billion annually, in the almost inconceivable case that the non-contact cooling water would need to be treated. These two estimates are based, respectively upon a 1992 study by the Utilities Water Act Group and a 1993 study by ENSR Consulting and Engineering (ENSR). We have excluded this last case in the range of cost estimates that we've used in assessing the economic effects of the GLI.

The two major operations in which the GLI will affect electric utilities are treating process wastewater and treating cooling wastewater. We examine each of these in turn.

a. Treating Process Wastewater.

Bringing process water into compliance with the GLI would cost electric utilities almost $500 million dollars annually (see Exhibit IV-5), according to estimates prepared for the Ad Hoc Utility Group by ENSR.[7] The estimates reflect an assessment of the compounds needing to be removed from the wastewater streams and the required cleanup technologies for generic coal, oil, and nuclear plants specified so as to be representative of the average generation facility of each type in the Great Lakes Basin. The wastewater

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7 *Regulatory Impact Analysis of the Draft Great Lakes Water Quality Initiative for the Electric Utility Industry*, study prepared for the Ad Hoc Utility Group by ENSR Engineering and Consulting, June 1993.

treatment costs for each facility get extrapolated to state- and basin-wide totals using effluent volume as the scaling factor

Exhibit IV-5

ENSR Estimates of the Costs of Compliance with the GLI

State	Affected Plants	Annual Cost (Millions of 1992 Dollars)		
		Total	Capital	O&M
Illinois	2	20	8	12
Indiana	4	30	10	20
Michigan	19	215	75	140
Minnesota	2	18	1	4
New York	11	265	22	43
Ohio	10	320	27	51
Pennsylvania	0	0	0	0
Wisconsin	10	334	28	51
Total	**58**	**493**	**172**	**321**

The ENSR analysis involves:

- identifying chemicals of potential concern (CPC);
- determining, for each outfall at each sample facility, those CPCs that would exceed the GLI limits;
- specifying the appropriate wastewater treatment system for each sample facility; and
- estimating the costs of wastewater treatment at each facility.

The cost estimates are derived from a variety of sources including published studies and judgments of professional consultants.

As a result of its study of each generic facility, ENSR identifies the following CPCs

- cadmium
- copper
- mercury
- chromium
- nickel
- lead
- selenium
- phenols

- PCBs
- zinc

ENSR evaluates likely loadings against limits for each of these CPCs at each of the three facilities

ENSR analysis of treatment options includes a preliminary screening of available technologies followed by a detailed assessment for each facility In the end, ENSR finds that each of the facilities require similar technologies including:

- chemical oxidation/reduction,
- chemical precipitation,
- ion exchange,
- carbon absorption,
- filtration,
- evaporation, and
- solidification of sludge.

In some cases, ENSR finds that process and cooling waters are commingled in the effluent streams. ENSR assumes that the two streams can be separated, thereby avoiding the expense of treating cooling water. This separation could be expensive, according to industry engineers, but this cost has not been included in the ENSR estimates. The study, moreover, recommends that the GLI standards be implemented in such a way that this separation would be unnecessary. The study asserts that the dilution of toxins that occurs in the facility when process waters commingle with cooling waters allows for better environmental protection than when such dilution and mixing occurs in the aquatic environment outside the facility.

b. Treating Cooling Wastewater.

The requirement that utilities bring cooling water discharges into compliance with the GLI limits would raise the costs of electric generation between 30 and 70 per cent, according to a study sponsored by the Utility Water Act Group (UWAG).[8] We haven't included these costs in our compilation of trade association estimates; given the enormity of these costs, full intake credits, which otherwise seem probable, become almost a certainty. Nonetheless, we have chosen to review the UWAG study to illustrate that rigid application of the GLI standards could prove exorbitantly costly.

The UWAG study assesses the economic and technological feasibility of removing pollutants originating in intake waters for a hypothetical 600 megawatt (MW) power plant under the worst case assumptions that:

- no mixing zones are allowed and

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8 *Removal of Intake Pollutants by Electric Utilities: An Economic and Technical Feasibility Analysis*, submitted to the Utility Water Act Group by CH2MHill, November 1992.

- EPA's water quality criteria apply to the whole effluent at the end of the discharge pipe.

The study also assumes that copper, the chemical chosen to illustrate the treatment methods and process options, appeared in the intake water in concentrations exceeding the GLI limitations

The UWAG study evaluates options involving:

- treating the entire cooling water flow and discharging the flow to a body of water;
- installing cooling towers to reduce the discharge volume, blowing down water to control salt buildup in the cooling tower, treating and discharging the blowdown to a body of water, and disposing of solids at an industrial landfill; and
- installing cooling towers to reduce the discharge volume, blowing down water to control salt buildup in the cooling tower, treating and recycling the blowdown back to the cooling tower, and disposing of solids at an industrial landfill (a generally closed-cycle option).

The study assumes that iron co-precipitation would be used in treating once-through cooling water and cooling tower blowdown under the second option, whereas evaporation and crystallization would be used under the generally closed-cycle system.

6. Automotive Industry

The American Automobile Manufacturer's Association (AAMA) made public a study they commissioned, which was undertaken by Chester Engineers, which analyzed potential changes in POTW permit limits as a result of GLI. While useful in and of itself, this study does not speculate on what restrictions will be borne by specific indirect dischargers, such as automobile manufacturers, not on their potential costs of compliance. Separately, the AAMA has announced that it expects incremental capital costs in response to GLI for Chrysler, Ford and General Motors alone to lie in the $2 billion range (along with $200 million per year in operating costs, this results in an annualized expense of roughly $400 million per year using the methodology laid out in Section IV. E. 1. of this report). While the analysis supporting these figures was not made available to DRI,[9] some comments and comparisons are provided here.

The method used by DRI to generate its own compliance cost estimates, in the absence of verifiable engineering data, was to allocate to SIC 37 (transportation equipment) that share of total POTW costs that this industry represents in each state's manufacturing sector. The total POTW costs were derived from the Hinshon report. Using this method, DRI estimated that for the entire SIC 37, compliance costs would total $316 million per

[9]The AAMA postulates that individual members of the Association cannot reveal estimates of treatment costs to their competitors (and, by extension, to the public) for fear of sparking anti-trust action by the U.S. Justice Department. In similar situations, third party analysts with established safeguards for dealing with confidential information have gained access to such figures; however in this case the timing of AAMA's and DRI's release schedules did not allow for such a procedure.

year[10] Taking into account that this estimate includes many parts manufacturers and some foreign auto manufacturers, the magnitude DRI's highest cost estimate (Policy Set A-High) appears to be roughly half that of the AAMA estimate DRI found many instances of costs that, for methodological consistency, had to be removed from other trade association studies (studies that DRI *did* have an opportunity to review), and for this reason we believe that our existing figure may be close to the conclusion we would have reached even if we had access to the AAMA confidential report.[11] Again, due to the timing of the AAMA information and the lack of supporting material, their estimate is reported here but not reflected in the four DRI scenarios.

The AAMA pointed out that because of the complexity of the automobile manufacturing process, and the larage number of input suppliers, the cost of process changes may be high relative to other industries Also, as compared with industries using primarily organic compounds for which substitutes exist, automobile assembly is a heavy user of elemental metals, most of which have unique properties for which there are no close substitutes.

Perhaps the most serious concerns raised by the auto industry regard the ability and willingness of POTWs to pass on treatment costs proportional to each discharger's contribution. If auto makers eliminate most of their zinc, for example, from their discharges, while other zinc users discharge large amounts into the public sewer system, the POTW may be forced to adopt expensive treatment technologies. If such double treatment is truly redundant, in an ideal world this information will be available and POTWs would encourage auto makers not to bother installing technologies to eliminate zinc. Even if that investment were already made on the part of auto makers, it would seem unreasonable for POTWs to "double-charge" auto makers for the elimination of the toxin. At the extreme, if auto makers are truly meeting water quality standards at end of pipe, they always have the option of re-cycling their process waters, thus eliminating the POTW's opportunity to charge them. The issues raised in this discussion suggest the need for regulators to create well-defined property rights and predictable permit limits, so that indirect dischargers and POTWs can arrive at efficient solutions.

D. Publicly Owned Treatment Works Would Bear the Brunt of GLI Costs

Compliance with the GLI would cost POTWs from $252 to $756 million (1992 dollars) annually, with an expected value of $376 million, according to estimates developed by Hinshon Environmental Consulting (HEC).[12] The estimates arise from a questionnaire completed by 170 POTWs representing more than 50 per cent of the municipal wastewater discharges throughout the Great Lakes basin. HEC also developed another, much higher cost estimate (not presented here) that assumed treatment of combined sewer overflows.

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10 See Appendix B.

11 For instance, AAMA officials indicated that a substantial portion of those costs were based on the assumption that the GLI would apply to storm water treatment – our methodology was to exclude such costs, even though we cannot entirely rule out the possibility that storm water flows will eventually be included.

12 Economic Assessment of the Cost of Compliance for Publicly Owned Treatment works Under the Great Lakes Initiative, Hinshon Environmental Consulting, December 4, 1991.

The HEC low-cost scenario assumes that POTWs:

- will not need to construct new treatment facilities beyond tertiary filtration;
- will focus on rigorously monitoring the discharges of industrial users to minimize pollution through source controls rather than new treatment facilities at the municipal plant; and
- will not need anti-degradation studies for incremental loading increases caused by new residential customers

The high-cost scenario assumes that POTWs:

- will need to install advanced waste treatment to control trace pollutants, such as mercury, that aren't attributable to discrete point sources and
- will still rigorously oversee industrial sources and institutions, including hospitals, in controlling pollution at the major sources.

Compliance costs for new and expanding facilities could be higher or lower than for existing facilities. The standards themselves contribute to higher costs. New facilities and effluent sources must comply immediately with anti-degradation and the numerical limits for BCCs without mixing zones. Technological advances, however, will lower costs. New plants will benefit from older plants going through the costly experience of learning to remove pollutants economically. Also new plants will be built with cleanup processes included in a convenient and economical manner within the facility, whereas older plants must make do with retrofitting. Thus, one can make a case for either higher or lower costs for new plants. Our estimates of overall regional costs assume that new and expanding facilities will face the same costs as current ones.

E. Conversion of Compliance Costs into Economic Impact

The benefit of an environmental program is not measured by counting the amount of pollution removed, but by analyzing the impact of that program on human health, wildlife, and the enhanced value of the improved resource. By the same token, measuring the cost of compliance with environmental regulations does not provide a complete nor an accurate portrait of their impact on the workings of the economic system.

Compliance costs must be either absorbed in the form of lower profits, or passed on to other firms and consumers as price increases. Lower profits affect the regional economy by reducing the incentive to invest, while higher prices merely spread the costs so that the pattern is repeated in other industries and states. Ultimately, as reduced competitiveness causes layoffs, a cycle of income and expenditure reductions spreads the impact beyond the manufacturing sector. A minor offsetting stimulus to the local economy is provided during the period when new treatment facilities are under construction.

It matters to the economy as a whole which sectors incur the initial compliance costs. For example, cement producers can generally recoup their higher costs through price increases, without worrying that European and Asian competitors will grab a share of their market; the same is not true for the automotive industry.

DRI has used the compliance costs estimates in the four scenarios as inputs to the DRI Model of the Great Lakes Economy in order to capture the effects described above Two sets of simulations were run one using the four scenarios developed by DRI, another based directly on the EPA cost study

Compliance cost estimates from trade associations were generally provided as totals for the entire Great Lakes Basin, with no state-by-state breakdown provided to protect the confidentiality of individual trade association members Model inputs were therefore distributed across states using the implicit distribution in the EPA cost study methodology That study reviewed permits for a sample of 50 of the 588 major NPDES dischargers, and 9 of the 3,200 minor dischargers. (See Exhibit IV-6.)

Cost estimates based on that permit review process were then extrapolated to the remaining facilities using effluent flow strata While this procedure is methodologically unsatisfying, not least because the costs and effluent flows in the EPA sample show a very low correlation, in the face of limited information on the economic characteristics of the dischargers it represents an understandable compromise. The number of dischargers for each industry sector in each state is known through the Permit Compliance System,[13] providing a useful base for the calculation. However, this methodology ignores the variance in permitting stringency across states. Thus Michigan, which has water quality criteria generally comparable with GLI, will under this methodology appear to incur high initial compliance costs, while in reality Michigan permit writers may not need to adjust many permits as a result of GLI.

For the two scenarios that are derived directly from the EPA cost study, their implicit distribution of costs across states is maintained,[14] as depicted in Exhibits IV-6 and IV-7. In DRIs Policy Set B, which assumes a relatively lenient implementation of the GLI, adjustments factors were used to re-distribute costs, reducing the bias from ignoring variance in permitting standards across states. Policy Set A, which assumes that GLI goes far beyond the "reasonable potential" standards in most states, maintains the EPA distribution of compliance costs for direct dischargers.

Across the scenarios, indirect dischargers incur from 1/3 to 2/3 of all compliance costs (see Exhibit IV-2). These facilities, whose effluent flows through municipal sewer systems (POTWs), could be affected in two ways: POTWs could use their pre-treatment programs to pass on their stricter permit limits directly to their dischargers, or treat the effluent themselves and pass on the costs in the form of higher fees. For both cases, DRI treated the higher costs as falling entirely on the manufacturing sector (ignoring the possibility that higher fees could be shared with residential and commercial dischargers as well), and used the distribution of manufacturing output in each state a proxy for the incidence of compliance costs.

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[13] an EPA-maintained data base of NPDES dischargers.

[14] The EPA did not release any state distribution, stating with justification that the distributions are not statistically significant given the small sample size (though it should be noted that a larger sample size would not have corrected for the bias from omitting state-specific permitting procedures). However, using the Technical Background Document that contained the replicate their methodology and generate the implicit distribution across states.

Exhibit IV-6

Implicit Distribution of Compliance Costs by State and Industry in EPA Study

Industry	IL	IN	MI	MN	NY	OH	PA	WI	Total	Percent
Mining	-	-	-	-	-	-	-	-	$0.1	0.1%
Food	-	-	$0.1	-	$0.1	-	-	-	$0.3	0.3%
Paper/Pulp	-	-	$6.1	-	$4.0	$0.2	-	$6.7	$17.0	15.9%
Inorganic Chem	-	-	$0.2	-	$0.2	$1.4	-	-	$1.9	1.8%
Org. Chem	$2.3	$2.4	$9.6	-	$9.5	$9.4	-	-	$33.2	31.0%
Metal Finish	$0.1	$0.1	$1.5	-	$0.4	$0.8	-	$0.2	$3.2	3.0%
Metal Mfg	$0.1	$0.4	$0.5	-	$0.4	$0.4	-	-	$1.8	1.7%
Steam Elect	$0.1	$0.2	$0.8	-	$0.4	$0.4	-	$0.3	$2.3	2.1%
Misc	-	$0.9	$0.4	-	$3.8	$0.8	$0.4	-	$6.4	5.9%
POTW	-	$3.7	$11.6	$0.5	$10.2	$9.6	$0.4	$5.0	$41.0	38.2%
Total	$2.7	$7.6	$31.0	$0.5	$29.1	$23.0	$0.9	$12.3	$107.2	100.0%
Percentage	2.5%	7.1%	29.0%	0.5%	27.2%	21.5%	0.9%	11.4%	100.0%	

in Millions of dollars (- indicates entry < $100,000) Direct Dischargers Only
Source: Derived from SAIC (1993) (Scenario #2)

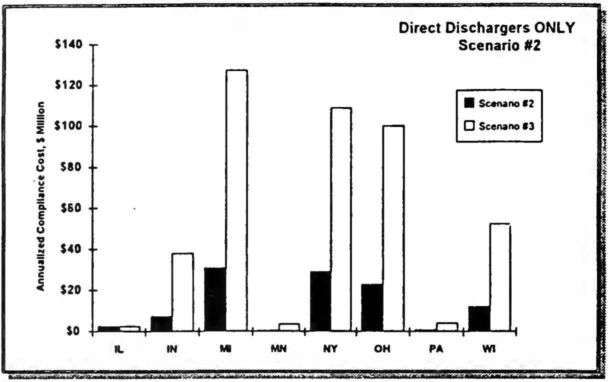
1. Annualization of Capital Costs

The trade association studies generally develop estimates of the recurring annual O&M costs and the up front capital investment needed to comply with GLI. DRI has applied a 10 per cent factor to the (1992-dollar) one-time investment in obtaining an annual payment that covers financing costs (debt and equity) and depreciation, net of tax benefits. This 10 per cent factor assumes

- one-third debt, two-thirds equity financing
- annual capital costs of 9 per cent for debt and 10 per cent for equity
- an economic depreciation rate of 8 per cent annually (reflecting construction-intensive investment)
- present value of tax depreciation deductions worth 50 per cent of the initial investment
- expected long-run annual inflation rate of 4 per cent
- marginal tax rate of 40 per cent.

Exhibit IV-7

Implicit Distribution of Compliance Costs by State in EPA Study



Using the formula for the fixed charge rate for a non-profit making investment, we obtain a value of about 10 per cent

$$\begin{aligned} FCR &= (r_d(1-\tau)w_d + r_e(1-w_d) + \delta - \pi)\cdot(1-\tau Z) \\ &= (.09(1-.4).33+.1(.67)+.08-.04)\cdot(1-.4(.5)) \quad (1) \\ &= .109 \end{aligned}$$

where r_d denotes the cost of debt, r_e the cost of equity, τ the marginal tax rate, w_d the debt share of total financing, δ the economic depreciation rate, π the expected inflation rate, and Z the present value of tax depreciation deductions.

This procedure differs from the technique used by the EPA cost study to annualize capital costs and results in estimates that are 20% lower on average.

2. DRI Economic Scenarios Reveal a Loss of Competitive Advantage for Great Lakes States

The added costs of achieving the water quality standards under the GLI will adversely affect the competitiveness of Great Lakes firms, resulting in a loss of market share for

industries absorbing compliance costs, and for their suppliers within the region. Losses in production, employment, and incomes in affected industries will be transmitted throughout the economy, reducing employment in services, trade, finance, utilities, and government. With fewer job opportunities, out-migration of population will increase, reducing demand for new housing. Investments in pollution abatement structures and equipment will provide some modest offsetting stimulus, concentrated in the 1997-2003 phase-in period.

The sections below discusses the methodology behind these findings in greater detail.

a. Economic Impacts of Compliance Costs: Methodology

DRI developed estimates of the economic impacts of the costs of compliance with the GLI through simulations of the DRI/McGraw-Hill Model of the Great Lakes Economy. Developed specifically for this project, the model is a dynamic system of over 1,400 equations describing the economic structures and linkages of the eight Great Lakes states. This econometric model of regional competition and growth captures the interactions between industry costs, production, employment, incomes, population movements, and construction markets in each of the eight states. The modeling structure provides a comprehensive and consistent framework for evaluating the economic impacts of the policy choices of the Council of Great Lakes Governors.

The industrial structure of the Great Lakes model embodies several innovations in regional modeling, including explicit input cost measures and inter-industry purchasing relationships. For 20 manufacturing industries and eight states, the model determines real shipments, employment, wage rates, wage and salary income, and an input cost index that includes capital, labor, electricity, and material costs. The model's eight non-manufacturing sectors include employment, wage rates, and wage and salary income.

The Great Lakes Regional Model is linked to the DRI/McGraw-Hill Quarterly Model of the U.S. Economy. The influence of national economic forces is shaped by state-specific conditions of relative costs, industrial structures, demographics, and income and spending patterns. Therefore, each state's changing competitive strengths and weaknesses determine its success in capturing a share of the national market. In addition, assumptions regarding the impact of major economic policy initiatives, such as the North American Free Trade Agreement (NAFTA) are built in to the "base case" for the GLI simulations.

Capital costs are the primary channel through which compliance costs affect industrial competitiveness. Secondary price effects are captured through the materials price index. As Great Lakes region manufacturers pass along higher capital costs in the prices of their goods, the relative cost of materials in the region increases. While adjustments to capital costs are specific to each industry and state, a common adjustment was made to the materials price index.

The direct impact of compliance costs on industry shipments depends on the percentage increase in total input costs, as well as on the price sensitivity of industry sales. To accurately capture the competitive effects of higher input costs on industrial shipments, DRI has constructed a set of input cost indexes for each manufacturing industry by state. The cost indexes are weighted averages of four component indexes for wage rates,

electricity costs, material prices, and a rental price of capital. Variable weights for each cost component are derived from DRI/McGraw-Hill's Factor Input Margin model, which uses input-output analysis to determine the contribution of different factors of production to total input costs by industry at the national level. Over time, the factor proportions of total input costs vary with shifts in technology and evolving inter-industry relationships. The price elasticity of industry shipments is determined in the estimation of the econometric model

b. Inter-industry Purchasing Will Also Be Affected

Another channel through which environmental policies affect regional economic activity is inter-industry purchasing relationships. The Great Lakes states have clusters of interdependent firms in related industries. Examples of clusters include motor vehicles, forest products, industrial machinery, and chemicals. Some firms will sell their products outside the region, while supporting firms provide raw materials, components, and support services. For example, demand for steel will be affected by changes in sales of automobiles or machinery by firms in the region. The Great Lakes Regional Model incorporates a unique set of inter-industry generated demand variables that capture a supplying industry's potential sales to other industries within the state or region. Purchase coefficients, expressed as a fraction of the purchasing industry's output, are derived from DRI/McGraw-Hill's Inter-industry Model and vary over time as technologies and industry structures change.

In summary, regional industrial output is influenced by a variety of competitive and structural forces. In the Great Lakes Regional Model, a state's share of the national market in a given industry depends on input costs, inter-industry demand, final market demand, and business tax rates--all expressed relative to the national standard. An increase in the costs of compliance with water quality regulations adversely affects industry cost competitiveness, directly reducing its sales. When one industry in a given state loses sales, all of its suppliers throughout the region suffer. Thus, the model simulates how compliance costs imposed in Ohio will reduce economic activity in Wisconsin, Michigan, and the other Great Lakes states.

c. Introduction of Compliance Costs Raises Capital Costs

A wide range of environmental policy options with varying compliance costs was considered. For both the lenient and stringent policy sets developed by DRI, we ran alternative simulations using high and low cost estimates. In each scenario, DRI developed estimates of compliance costs by industry and state. Compliance costs include the costs of investing in new facilities and technologies, together with increases in operating and monitoring costs. Costs incurred by manufacturing firms were grouped according to their two-digit Standard Industrial Classification (SIC) codes.

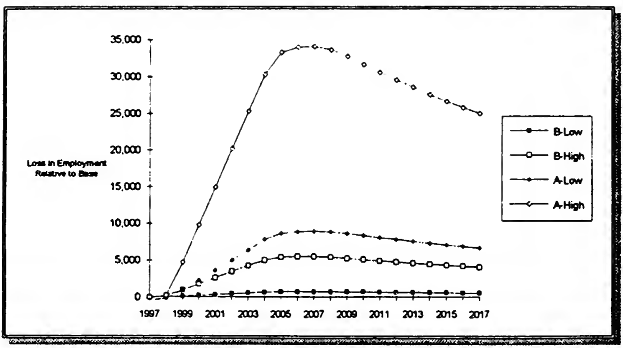
The following industries are affected in one or more states: food processing; tobacco; textiles, lumber and wood products; paper; printing and publishing; chemicals; petroleum refining; rubber and plastics; leather; stone, clay, and glass; primary metals; fabricated metals; non-electrical machinery; electrical equipment; transportation equipment; instruments; and miscellaneous manufacturing.

In each model simulation, compliance costs by state are introduced by raising an industry's capital cost index by a multiplicative factor to reflect the annual costs of financing and operating pollution abatement structures and equipment. Investments are assumed to be financed and depreciated over a 10-year period. Regulations are phased in over a seven-year period from 1997 through 2003. Thus, the proportionate increase in capital costs rises steadily through 2003 and then stabilizes.

Investments in new facilities will provide some offsetting stimulus to construction markets. The Great Lakes Regional Model includes real investment in nonresidential (and residential) structures by state. Real investment in structures, along with population changes and relative wage rates, determines construction employment. In each simulation, we assumed that investments in plant and equipment equal 50% of total compliance costs and would be divided equally between structures and equipment. For each state, the sum of capital expenditures on structures for all affected industries was added to real investment in nonresidential structures. The stimulus to construction activity is concentrated in the 1997-2003 period, as regulations are phased in. After 2003, the impact is diminished because only replacement investments are undertaken.

Exhibit IV-8

Potential Employment Loss as Result of GLI
(Number of Jobs)



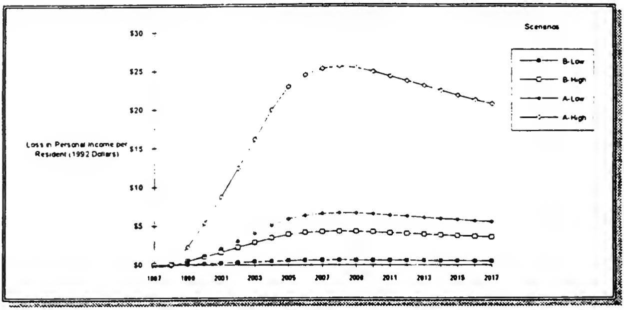
F. The Economic Impact to the Great Lakes States: Jobs and Competitiveness

1. Time Path of GLI Impacts

State officials have estimated that under the most optimistic timetable for the implementation of GLI, the first permits to be reviewed subject to the Guidance would be in 1997 Each year, roughly one-fifth of the outstanding permits are up for renewal, but due to variances and other delays, the bulk of the permits will probably not reflect the new procedures until seven years have passed. Therefore, in these simulations, the compliance costs were phased-in in equal increments between 1997 and 2003.

Exhibit IV-9

Impact of GLI on Annual Income per Resident
1997 - 2017



2. Impact on States

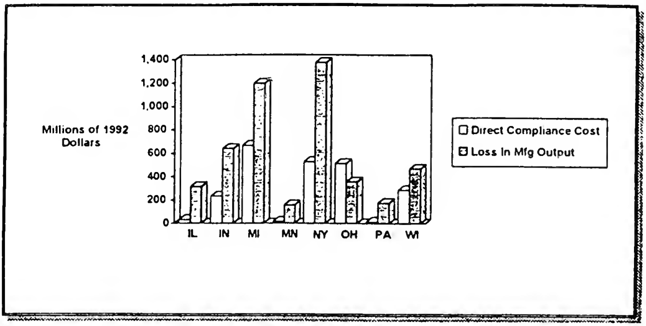
The economic impact of GLI on individual states does not closely follow the pattern of direct compliance costs. Just as the ill effects of pollution are easily transported across state boundaries, so are the costs of environmental clean-up easily transmitted between states.

Exhibit IV-10 shows how direct compliance costs translate into changes in manufacturing output on a state-by-state basis, for Scenario A-High in the year 2005. While Michigan, New York and Ohio experienced compliance costs on the order of $600 million each, their loss in manufacturing output varied widely, because of their role in the national economy. The economies of New York and Michigan each produce inputs to thousands of facilities that will be affected in each of these states, and consumer goods for many of the workers

that will be laid off On the other hand, a large proportion of Ohio's discharges are oil refineries, which do not have strong backward linkages, so the state is somewhat insulated from the costs of the clean-up program.

Exhibit IV-10

Comparison Between Compliance Costs and Loss in Manufacturing Output by State
Scenario A-High, Year 2005



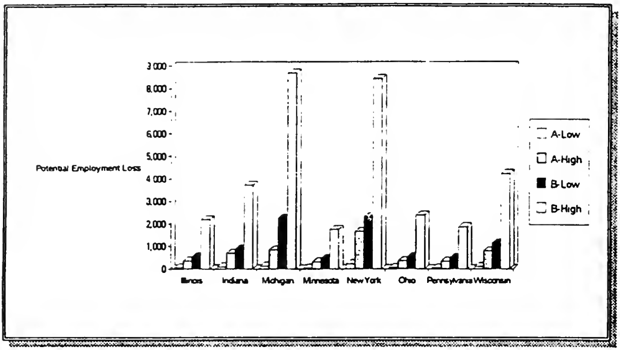
Conversely, states such as Illinois, Pennsylvania and Minnesota, precisely because of their low direct compliance costs, exhibit a high ratio of output loss to direct cost. This is not because the income multiplier is higher in those states, but simply because these states will continue to soak up larger indirect effects the larger the clean-up costs incurred by their neighbors. To further illustrate this point, consider New Jersey, which will have no compliance costs at all, but significant indirect effects.

The distribution of employment loss for all four scenarios is depicted in Exhibit IV-10, which again shows New York, Michigan, and Wisconsin bearing the brunt of the costs.

As more information regarding the impact of GLI becomes available, state officials and other interested parties will be motivated to re-cast the estimates using updated cost estimates. Tables in Appendix B shows how costs from individual states are propagated to the other states.

Exhibit IV-11

Distribution of Employment Loss by State, Year 2005



3. Impact on Industry and Competitiveness

The manufacturing sector will bear the brunt of the impact of GLI, and the DRI Regional Model indicates that industries will not prove very adept at passing off these costs on to the consumer. Because compliance costs are primarily fixed capital costs, that cannot be adjusted *ex post* according to the level of output, the effect of GLI behaves similar to a non-distorting, lump sum tax.

The "lump sum nature" of the compliance costs explains why the ratio of foregone output to compliance cost for GLI is fairly low — roughly 2:1. Furthermore, because the manufacturing sector is capital-intensive, the loss of jobs is relatively modest for an impact of this size. Thus the total loss in personal income in the region is actually smaller than the magnitude of the capital cost outlays. On balance sheets, profits will be affected far more than payroll expenditures.

To the extent that profits will suffer, those few facilities that were on the verge of shutdown will be pushed over the threshold by this regulation. But on the whole, the economic system will spread the costs among industries relatively efficiently, and for the most part, owners of capital will be the primary losers. This does not show up in the DRI

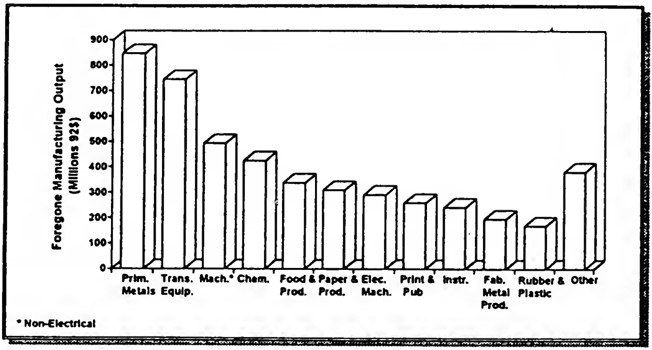
model's reporting of personal income losses, because profit losses can only affect this measure through lower dividends, and dividend payments tend to fluctuate less than corporate profits

Also, the regional model does not depict individual firms, but industries at the state level, so shutdowns cannot be predicted directly. This is picked up indirectly by incorporating the historical relationship between increases in the local cost of doing business relative to the nation, and changes in the level of employment in each sector. In other words, competitive pressures determine the number of jobs in each industry, and when prices rise to the point where they are less competitive, a combination of layoffs and shutdowns adjusts the size of the industry.

Two figures are provided here to illustrate the sector-specific impacts of GLI (Exhibits IV-12 and IV-13). The two most extreme scenarios are portrayed, showing loss of output in the year 2005. For Scenario A-High, primary metals, transportation equipment, and non-electrical machinery are hit the hardest, absorbing $2 billion or 44% of the total loss in output. For Scenario B-Low, transportation equipment, non-electrical machinery, and chemicals are affected the most, although the magnitudes are far smaller at $43 million.

Exhibit IV-12

Relative Impact of GLI on Manufacturing Industry
Scenario: A-High

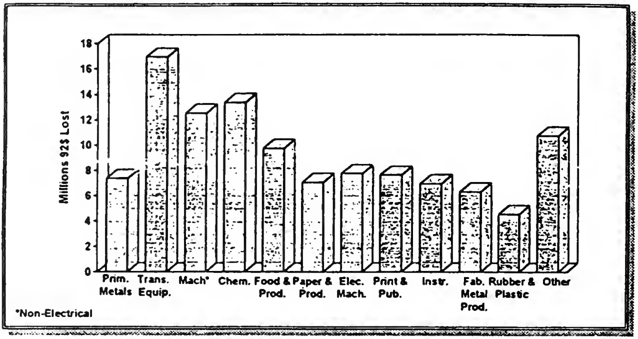


For the six industries with the highest impact in each scenario, the compliance costs are compared with the total loss in output in Exhibit IV-14 and IV-15. It should be kept in mind that the ratios between costs and output loss shown in this figure are not *multipliers*,

since they do not isolate incremental cost increases from one industry, but represent the total impact of cost increases in all sectors taken together.

Exhibit IV-13

Relative Impact of GLI on Manufacturing Industry
Scenario: B-Low



Looking at individual industry multipliers, as reported in Appendix B, we find that sectors such as transportation equipment and chemicals have multipliers almost three times the size of those for primary metals and the paper industry. The former industries have a high impact because they currently purchase a vast quantity of inputs from local producers, and when they reduce their output levels, the entire region suffers. The latter set purchase most of their inputs in raw form, and therefore reduced output in these sectors does not impact the region to the same degree. These industries will attempt to pass on their increased costs in the form of price hikes, but when their customers in the Great Lakes region find these products too expensive, they can generally find substitutes from suppliers outside the Basin.

Exhibit IV-14

Compliance Costs vs. Loss in Manufacturing Output by Sector
Scenario A-High, Year 2005

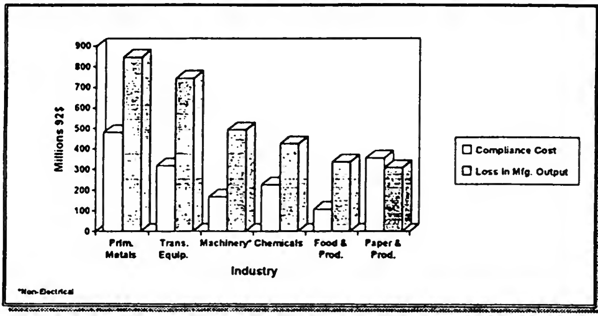
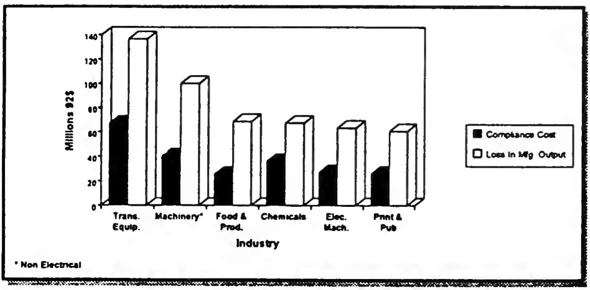


Exhibit IV-15

Compliance Costs vs. Costs in Manufacturing Output by Sector
Scenario: B-High, Year 2005



G. Putting the Economic Impact into Perspective

While many observers have become alarmed at the potential for GLI costs to exceed $2 billion, it should be emphasized that even an impact of this size would be imperceptible in a region this large. The eight states bordering the Lakes comprise nearly one-third of the total US population, and over one-third of the manufacturing output.

As shown in Exhibit IV-15, the worst-case scenario would reduce personal income by less than one-tenth of one percent, and manufacturing output by 0.33%. These magnitudes are nearly imperceptible, the region can clearly afford the GLI

Exhibit IV-16

Costs are Spread from State to State

	Share of Compliance Cost	Share of Loss In Personal Income	Share of Loss In Manufacturing Output
Illinois	1%	6%	7%
Indiana	10%	10%	14%
Michigan	29%	23%	26%
Minnesota	1%	6%	3%
New York	23%	35%	29%
Ohio	22%	5%	8%
Pennsylvania	1%	6%	4%
Wisconsin	13%	10%	10%
TOTAL	100%	100%	100%

Based on DRI Scenario A-High

Of course, a reduction in manufacturing output of 0.33% should not be taken lightly, and every effort should be made to make GLI more cost-effective, so that those resources can be directed toward their best possible use: it may be, for example, that non-point source reductions will have a high price tag,[15] and the bulk of the regions capacity to absorb

[15] Non-point source reductions of toxic pollutants are expected to impact coal-fired electricity generation, for example, and the multiplier effects from these compliance costs are likely to be significantly higher, since they impact all sectors of the economy, including residential, in the first round. On balance, however, DRI would expect the overall economic impact per cost per pound of, say, mercury removed to be far lower for non-point sources than for point sources.

costly legislation should be reserved for the projects that will have the greatest impact on beneficial uses of the Lakes

Exhibit IV-17

Putting the Economic Impact into Perspective

Costs of GLI Relative to Great Lakes Economy For the Year 2005

	Scenarios			
	B-Low	B-High	A-Low	A-High
Percentage Loss in Manufacturing Output (Relative to Base)	0.008%	0.057%	0.088%	0.337%
Percentage Loss in Personal Income (Relative to Base)	0.002%	0.016%	0.024%	0.094%
Loss in Personal Income per Resident (1992 dollars)	$0.55	$3.90	$5.91	$22.95

V. Benefits of Complying with the Great Lakes Water Quality Initiative

The benefits of the Great Lakes Water Quality Initiative (GLI) must ultimately be measured in terms of their effect on the fitness of Great Lakes water for its designated uses. These uses include drinking, swimming, protecting aquatic life, and fish consumption. Our best overall indicator of the condition of the Lakes is represented by the number of shoreline miles meeting the standards for a designated use.

A water body's fitness for its designated use is affected by the level of existing and incremental contamination. The main intent of the GLI is to reduce the incremental contamination, known as "loadings," taking place each year. However, the degree to which the GLI would achieve reductions in either existing levels or loadings is difficult to measure.

In this chapter, we present information showing that virtually all shoreline miles of the Great Lakes meet the standards that ensure their fitness for drinking and swimming. The problems associated with toxins in the Great Lakes center upon aquatic wildlife. Fish consumption advisories exist throughout the Great Lakes. Currently PCBs are responsible for the fish consumption advisories and these advisories are not going to be lifted for some decades -- with or without the GLI.

Once the PCB levels have been reduced through a natural process of volatilization, fish advisories in the Niagara River and Lake Ontario may be lifted due to GLI, because GLI is projected to eliminate some 95% of current dioxin loadings from all sources. This is the single most tangible benefit of GLI.

In addition we explore the matter of measuring the impact of the GLI on the contaminants themselves. While this study could not review the permits of over 500 major dischargers, several existing studies have been evaluated to estimate the current and future loadings throughout the region.

In sum, the changes in beneficial uses following the implementation of GLI will be modest, and largely contingent on future actions regarding non-point sources.

A. Baseline Status of the Great Lakes

1. Water Quality

Water quality is typically described in terms of how well the body of water meets its intended or designated use. These uses include drinking, swimming, protecting aquatic life, and producing fish for consumption. The degree to which the Great Lakes meet their water quality goals can be measured by the number of shoreline miles meeting the standards for a designated use.

The federal Clean Water Act requires states to report biennially on the quality of water within their borders. The data given in Exhibits V-1 - V-4 were taken from the 1992

editions of the state reports, commonly referred to as "305b reports." While states differ in the methods they use to designate uses and to determine whether their waters meet these uses, the 305b reports provide a useful overall picture of the states' view of their water quality.

In the following subsections, we report on the degree to which the states' Great Lakes waters meet these designated uses.

a. Designated Use: Drinking

Exhibit V-1 shows the number of Great Lakes shoreline miles for each of the eight Great Lakes and the number of miles of shoreline meeting the designated use for drinking water. For those states that report on drinking water, 98% of the shoreline miles fulfill the state's criteria for drinking water supply. The relatively large number of shoreline miles in Michigan not meeting their designated use for drinking water is due largely to taste and odor problems caused by algae blooms in Saginaw Bay.

Exhibit V-1

Great Lakes Shorelines Meeting Designated Use for Drinking Water Supply

		Miles Meeting Designated Use		
State	Shoreline Miles	Full	Partial	Not
Minnesota*	272			
Wisconsin	840	820	20	
Illinois	63	63		
Indiana	43	43		
Michigan**	3288	3208		80
Ohio*	236			
Pennsylvania*	45†			
New York	577	576	1	

*Not reported in 305b report.
**Michigan does not use partial designations.
†Estimated.
Source: State 1992 305b reports.

These data are consistent with the results of our review of reports of noncompliance with federal drinking water Maximum Contaminant Levels (MCLs). At the request of DRI/McGraw-Hill, the U S EPA searched its Federal Reporting Data System for all notices of exceedances of MCLs for surface water supply systems anywhere in the eight Great Lakes states during federal fiscal year 1991. (This search did not examine exceedances of MCLs for parameters like turbidity and bacteriological contaminants, which are not addressed by the GLWQG).

Only 11 relatively small water supply systems indicated exceedances of MCLs at some time during the year. Nine of these 11 exceeded the MCL for total trihalomethanes, which are more likely to be formed during the disinfection of water with chlorine than to be present in the water supply itself. Only two small systems, serving a total of 2,300 people, had exceedances of MCLs for contaminants other than trihalomethanes, and these systems do not take their water from the Great Lakes.

Exhibit V-2

Great Lakes Shorelines Meeting Designated Use for Swimming

		Miles Meeting Designated Use			
State	Shoreline Miles	Full	Partial	Not	Not Assessed
Minnesota	272	23.2			248.8
Wisconsin	840	780	40	20	
Illinois	63	62.3	0.7*		
Indiana	43	43			
Michigan**	3288	3287		<1	
Ohio	236	231	5		
Pennsylvania†	45††				
New York	577	483	94		

*Partial support with minor impairment
**Michigan does not use partial designations.
†Not reported
†† Estimated
Source: State 1992 305b reports.

The results of this database search and the data in Exhibit V-1 do not necessarily mean that chemical contaminants are not present or not detected in the waters of the Great

Lakes Rather, they indicate that, with minor exceptions, contaminants in waters of the Great Lakes are not present at concentrations high enough to cause concern, given state and federal standards for drinking water.

b. Designated Use: Swimming

One goal of the Federal Clean Water Act is that, wherever attainable, waters be of sufficient quality for swimming To measure progress toward this goal, states are required to report in their 305b reports the degree to which their water bodies achieve their designated use for swimming. These data are presented in Exhibit V-2.

Almost all (97%) of the assessed waters of the Great Lakes meet their designated use for swimming. Where waters are determined not to be meeting their designated uses for swimming, the cause is usually bacteriological contamination. High turbidity levels are also responsible for beach closings along the New York shoreline of Lake Ontario.

Exhibit V-3

Great Lakes Shorelines Meeting Designated Use for Protecting Aquatic Life

		Miles Meeting Designated Use			
State	Shoreline Miles	Full	Partial	Not	Not Assessed
Minnesota	272			23.2	248.8
Wisconsin	840	720*	120		
Illinois	63	63*			
Indiana	43		43		
Michigan**	3288			3288	
Ohio	236		236		
Pennsylvania†	45††				
New York	577	577			

*Threatened
**Michigan does not use partial designations.
†Not reported
†† Estimated
Source: State 1992 305b reports.

c. Designated Use: Protecting Aquatic Life

The amount of shoreline meeting its designated use for protecting aquatic life varies tremendously among the Great Lakes states, as shown in Exhibit V-3 These variations are more indicative of differences in the way the states determine whether the designated use is met than of actual differences in water quality Nevertheless, the degree of use attainment is substantially less for protecting aquatic life than for drinking or swimming. This reflects the fact that water quality standards for many chemicals are more stringent for the purpose of protecting aquatic life than for the purpose of drinking or swimming.

d. Designated Use: Producing Fish for Consumption

Fish consumption advisories exist throughout the Great Lakes. This fact is illustrated in Exhibit V-4, which shows that nearly all of the Great Lakes shoreline miles fail to fully meet their designated use for fish consumption. These advisories are based upon the presence of chemicals in the Great Lakes ecosystem that are long-lived and tend to accumulate in body fat (except mercury, which accumulates in muscle).

Exhibit V-4

Great Lakes Shorelines Meeting Designated Use for Producing Fish for Consumption

		Miles Meeting Designated Use		
State	Shoreline Miles	Full	Partial	Not
Minnesota	272			272
Wisconsin	840		840	
Illinois	63			63
Indiana	43		43	
Michigan	3288*			3288
Ohio	236		236	
Pennsylvania	45**		45†	
New York	577	85	492	

*Michigan does not use partial designations.
**Estimated
†Assumed based on fish consumption advisories.
Source: State 1992 305b reports.

These chemicals, which the GLI refer to as bioaccumulative chemicals of concern (BCCs), accumulate to increasing concentrations along the food chain. Therefore, their

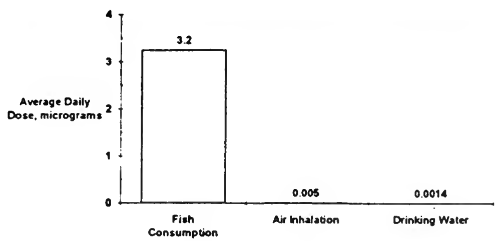
concentrations in fish are orders of magnitude higher than those in the water in which the fish live. In general, the older and larger the fish, the higher it is in the food chain, and the greater its fat content, the higher the concentrations of BCCs it will contain.

The issue of contamination of fish consumed by humans is important because it represents the primary means by which humans are exposed to toxins in the Great Lakes. this is illustrated for the case of PCBs in Exhibit V-5, which shows that human exposure to these substances by means of fish consumption is tremendous multiple of that occurring by means of air inhalation or drinking water.

It should be noted that the fish consumption rate used in Exhibit V-5 is that used by the EPA as the national rate of freshwater fish consumption, which has been criticized as being too low.[1,2] Higher fish consumption rates, whether they be for average consumers or subsistence or sport fishermen, would further emphasize the point that fish consumption is a far larger source of human exposure to PCBs than air or drinking water.

Exhibit V-5

Comparitive Human Exposure to PCBs in the Great Lakes Basin



Assumption and Sources:
Fish Consumption = 6.5 grams/day @ 0.5 ppm PCBs
Air Inhalation = 20 m³/day @ 0.25 ng/m³ PCBs (8)
Drinking Water Consumption = 2 liters/day @ 0.7 ng/l PCBs (2)

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1 COLBORN, THEODORA E.; DAVIDSON, ALEX; GREEN, SHARON N., R.A.; DODGE, (TONY); JACKSON, C. IAN; LIROFF, RICHARD A.; 1990, *Great Lakes Great Legacy?* The Conservation Foundation Washington, DC/ The Institute for Research on Public Policy, Ottawa, Ontario.

2 GREAT LAKES SPORT FISH ADVISORY TASK FORCE, JUNE 1993, *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory.*

The contaminants responsible for fish consumption advisories and commercial fishing bans for the Great Lakes and connecting channels are listed in Exhibit V-6. With the exception of mercury and dioxins (which are produced as unwanted byproducts) the uses of all seven of these contaminants has been banned or severely restricted in the United States and Canada However, despite these restrictions, large quantities of PCBs are still in use in the United States in closed systems, primarily electrical transformers, and may continue to enter the environment from leaks or spills from this equipment Similarly, atmospheric deposition of DDT has been estimated to be 10 per cent to 20 per cent of its peak flux in the 1960s due to its continued use in Mexico and Central America.[3]

Actually, relatively few of the dozens of pollutants present in the Great Lakes are responsible for fish consumption advisories for those waters. This is the case even though states periodically survey fish for far more pollutants than those listed in Exhibit V-6.

Exhibit V-6

The Use of PCBs and Most of the Other Contaminates that Cause Fish Consumption Advisories Is Banned or Severely Restricted.

Contaminants Responsible for Fish Consumption Advisories in the Great Lakes

Water Body	Chlordane	Contaminant DDT	Dieldrin	Dioxins*	Mercury	Mirex	PCBs
L. Superior	X				X		X
L. Michigan	X	X	X		X		X
L. Huron							X
St Clair R					X		X
L. St. Clair					X		X
Detroit R					X		X
L. Erie	X						X
Niagara R.				X		X	X
L. Ontario				X		X	X

* Dioxins and/or dibenzofurans

Note: Wisconsin has issued advisories due to "pesticides" (chlordane, DDT, dieldrin, or toxaphene) for Lakes Michigan and Superior.

States differ in their procedures for issuing fish consumption advisories; however, work is underway to create a uniform protocol for advisories.[4] One likely outcome of this effort

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3 Rapaport, R.A.; Urban, N.R.; Capel, P.D.; Baker, J.E.; Looney, B.B.; Eisenreich S.J.; Gorham, E., 1985, *"New" DDT inputs to North America. atmospheric deposition.* Chemosphere 14:1167-1173

4 Great Lakes Sport Fish Advisory Task Force, June 1993, *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory.*

would be more stringent standards for contaminant concentrations in fish than those issued by the Food and Drug Administration, which some states use in issuing advisories. It is unclear how these more stringent standards would change the data presented in Exhibits V-5 and V-6. Since fish consumption advisories for PCBs are already ubiquitous throughout the Great Lakes states, for example, this column of Exhibit V-6 would not be affected at all.

Monitoring and reporting on the effect of fish consumption by land-bound wildlife in the Great Lakes basin is not carried out as it is for human consumption. States are not required to report on the effects of water quality on wildlife as part of their 305b reports. Nevertheless, numerous studies show a range of effects on fish-eating species in the Great Lakes region. These effects are presented in Exhibit V-7.

Exhibit V-7

Wildlife and Fish Species Known To Be Affected by Contaminents in the Great Lakes

Species	Population Decrease	Effects on Reproduction	Eggshell Thinning	Congenital Malformations	Behavioral Changes	Biochemical Changes	Mortality
Mink	●	●	NA	NE	NE	NE	●
Otter	●		NA	NE	NE	NE	?
Double-crested Cormorant	●	●	●	●		●	?
Black-crowned Night Heron	●	●	●	●		●	?
Bald Eagle	●	●	●	NE		NE	NE
Herring Gull		●	●	●	●	●	●
Ring-billed Gull				●		NE	●
Caspian Tern		●		●	NE	NE	
Common Tern		●	●	●		●	
Forster's Tern		●		●	●	●	
Snapping Turtle	NE	●	NA	●	NE	NE	NE
Lake Trout		●	NA			●	
Brown Bullhead			NA			●	
White Sucker			NA	●		●	

Source: Adapted from Environment Canada, 1991
● = documented effect
NA = not applicable
NE = not examined
s = unpublished records
? = suspected, since population declined

2. Pollutant Loadings

Environmental benefits achieved through the GLI will depend on their changing the amounts of pollutants in the Great Lakes system. One key factor affecting the amounts of contaminants in a system is the rate at which pollutants enter the system. These incremental pollutants, referred to as "loadings," are generally measured in pounds or kilograms per year. One source of loadings to the Great Lakes system, and the one that the GLI implementation procedures primarily address are point source discharges, that is, discharges from distinct outfall pipes, as opposed to diffuse (non-point) sources such as agricultural runoff or infiltration of contaminated ground water.

DRI/McGraw-Hill requested data from the U.S. EPA on the 1991 point source loadings to the Great Lakes basin for two dozen pollutants. Our purpose was to determine the baseline point source loadings for the pollutants seen as most responsible for impairing the

uses of water and to determine how total loadings of these pollutants might change upon implementation of the GLI.

The loadings data were supplied by the Region V office of the EPA, by means of the agency's Permit Compliance System database. This database compiles the monthly discharge monitoring reports for all permitted facilities in the Great Lakes basin. The agency used the same procedures used to calculate loads for our request as they have to answer Congressional inquiries about loading rates and to write the Lake Michigan Lakewide Area Management Plan.

The results of the EPA's calculation of pollutant loads are presented in Exhibit V-8. These data are given for each lake basin, and include discharges directly to the lake and discharges to tributaries feeding the lake. The sums of the discharges to each Lake Basin are also listed.

Exhibit V-8

Point Source Pollutant Loadings to the Great Lakes in 1991, kg

Pollutant	Lake Basin					
	Superior	Huron	Michigan	Erie	Ontario	Total
Chlordane, technical mixture			31			31
'4 4'-DDT						--
'4,4'-DDD					17	17
'4,4'-DDE					0 3	0 3
Dieldrin			8		0 3	8
Heptachlor			4	0 0	2	6
Heptachlor Epoxide						--
Hexachlorobenzene	106	0 3	162	10	29	306
Mirex					1	1
PCBs	6	20	36	88	17	167
'2 3 7,8-TCDD	0		2 7			3
Toxaphene			32			32
Pentachlorophenol	157	4		19	137	318
Phenol single		11		342	4 433	4 786
Cyanide, free*		279	4,398	22,546	2,712	29 935
Cyanide free**			57	1 5		59
Cyanide total			74 378	53 846	9 964	138 167
Cadmium, total	67	28	3 195	6,641	1,673	11,604
Chromium VI	6	6	2,840	638	115	3 604
Copper, total	1796	5,222	40 253	31,811	20 464	99 545
Lead			3,163	345	300	3 808
Lead total	555	106	9 662	19,941	8 609	38,873
Mercury			64	0		64
Mercury, total	11	1	135	414	120	681
Nickel, total	830	112	22,852	72,266	14 141	110,208
Selenium total	62		12	121	1 818	2,012
Silver total	92	29	319	564	4 135	5,138
Zinc, total	5433	7,997	108,525	158,157	80,738	360,849

*amenable to chlorination
**water plus wastewaters

Source U S Environmental Protection Agency Permit Compliance System

Several aspects of the calculations used to arrive at the data in Exhibit V-8 warrant explanation. As noted above, these data are based on the results of each facility's discharge monitoring report. When monitoring data have been reported as non-

detectable, the EPA calculation of loads takes these values to be zero. For some pollutants, like cyanide and mercury, several different methods may be used for measuring concentrations. Therefore, multiple loading rates are given, depending on the method of analysis used

Also, the data in Exhibit V-8 must be compared with other sources of the same pollutants into the lakes Only then can one gain some sense of the potential benefits to be achieved by reducing the loading from the permitted sources. Unfortunately, quantitative data on the loading of pollutants to the Great Lakes from non-point sources are extremely rare, although estimates have been made of the rate of atmospheric deposition for a number of compounds. (Atmospheric deposition refers to toxic pollutants that pass from the air into the water.)

We present a comparison between point-source loadings and atmospheric deposition in Exhibit V-9 This table compares recent estimates of atmospheric deposition of 12 toxic chemicals to the Great Lakes with the loadings from Exhibit V-8. This comparison is limited in that only a subset (of 12) of the pollutants in Exhibit V-8 are listed, and more importantly, in that other sources of pollutants are not listed at all. These other sources include releases from contaminated sediments, surface runoff, and contaminated ground water infiltration. For the naturally occurring substances (metals), data on natural fluxes from the atmosphere, in tributaries, and from ground water must also be considered.

Exhibit V-9

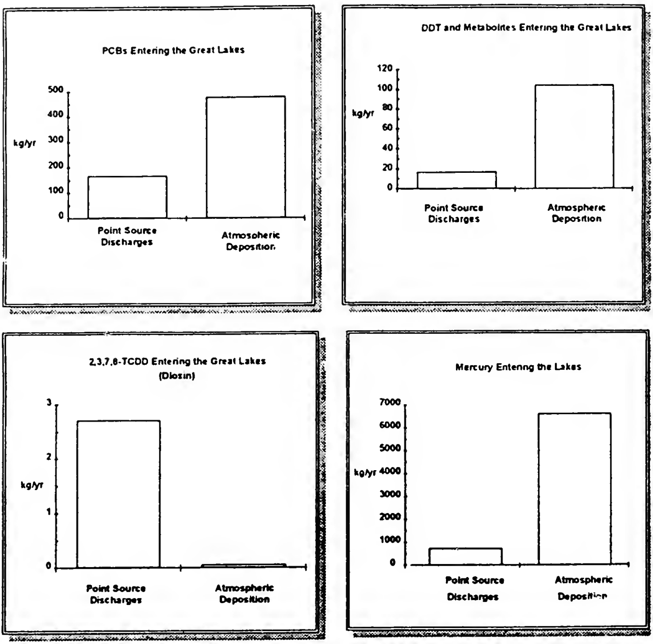
Comparison of Point Source Discharges and Atmospheric Deposition to the Great Lakes, kg/yr

Chlordane	31 1	40.2	44%	-
t-DDT	16.9	104.7	14%	-
Dieldrin	7.8	16.0	33%	-
Heptachlor	5.8	4.1	58%	-
Heptachlor Epoxide	0.0	20.1	0%	-
Mirex*	0.9	3.1	21%	-
t-PCBs	167.3	480.0	26%	4%
2,3,7,8-TCDD	2.7	0.1	98%	-
Toxaphene	32.1	52.9	38%	-
Cadmium	11604 0	37187.0	24%	-
Lead	42681.0	259401.0	14%	-
Mercury, total	744.5	6624.0	10%	-

Sources EPA Permit Compliance System and Eisenreich and Strachan, 1992 (8), except as noted
*Atmospheric deposition data from Strachan and Eisenreich, 1988 (9)
**For Lake Michigan only (See Exhibit V-15) For other pollutants, data for sediments and leaking waste sites is not sufficient

Exhibit V-10

Point Source Contributions Are Dwarfed for Most BCCs by Atmospheric Deposition



Sources Eisenreich, Steven J.; Strachan, William N.J., April 1992, *Estimated Atmospheric Deposition of Toxic Substances to the Great Lakes, An Update*, A Workshop Held at the Canada Centre for Inland Waters, Burlington, Ontario, January 31 - February 2, 1992, EPA Permit Compliance System.

Exhibit V-10 illustrates the comparative roles of point-source discharges and atmospheric deposition for four contaminants. For PCBs, DDT, and mercury, atmospheric deposition represents a multiple of point-source loadings into the Great Lakes. Dioxin is an exception in that its point-source loadings exceed atmospheric deposition of the

contaminant. The exhibit underscores the fact that in addressing only point-source contributions, the GLI is addressing less than half of the pollution problem in the Great Lakes

B. Potential Environmental Benefits of the GLI

1. Loading Reductions

Any environmental benefits that result from the GLI will derive from the reduction in pollutant loadings to the Great Lakes. Accurately projecting the change in loading would involve comparing the discharge from each facility with and without the GLI. This in turn would involve the recalculation of permit limits for hundreds of facilities and thousands of pollutants. We have employed two approaches to reduce this burden. In its study of the compliance costs for the GLI,[5] the U.S. EPA selected a sample of 50 facilities to represent the major dischargers to the lakes. We extrapolated the effects on these facilities to the universe of facilities in the Great Lakes regions based on the flow of the dischargers.

We have also examined the effects the GLI would have on hypothetical facilities. The National Wildlife Federation[6] studied the effects on a single facility in each of the Great Lakes states. In an exercise requested by Senator Carl Levin, the U.S. EPA has prepared comparisons of permit limits calculated using existing state procedures for three hypothetical facilities with the EPA's interpretation of what the limits would be under the Guidance.[7]

2. EPA Cost Study of 50 Sample Facilities

Each of these approaches has its shortcomings. In examining sample facilities as part of its cost study, the EPA based its changes in loadings on the difference between existing permit limits and those of the GLI. (Where the permit required monitoring, but did not impose a limit, loadings were based on the highest reported effluent concentration.)

This approach tends to overstate the loading reductions for three reasons:

- First, many facilities discharge at less than their permit limits. Since the EPA effectively assumed that all facilities discharge at their permit limits, the actual reductions in loading after GLI implementation would be lower than indicated.
- Second, in situations in which monitoring data were used to calculate loads, the practice of using the highest reported concentration rather than an average overstates the actual loadings. Again, these would overstate the reduction to be brought about by the GLI.

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5 Science Applications International Corporation, April 16, 1993, *Assessment of Compliance Csots Resulting from Implementation of the Proposed Great Lakes Woter Quality Guidance.*

6 *Cutting the Poisons: Estimated Reductions in Point Source Loadings of Great Lakes Toxic Pollution from the Great Lakes Water Quality Initiative*, May 11, 1993, National Wildlife Federation/Great Lakes Natural Resource Center.

7 *Letter to Senator Carl Levin from Tudor T. Davies, Acting Deputy Assistant Adminsitrator, U.S. Environmental Protection Agency*, June 17, 1993.

- Third, in some cases where discharges are not significantly different from permit limits, the permit limits do not reflect current regulatory requirements such as the National Toxics Rule Therefore, at least some of the loading reductions attributed to the GLI would actually be due to another regulatory

Exhibit V-11

Comparison of Baseline Loading and Reductions Estimated in EPA Study with Loading Calculated by EPA's Permit Compliance System

Table 9 Comparison of Baseline Loading and Reductions Estimated in EPA Cost Study with Loading Calculated by EPA's Permit Compliance System

	Pollutant Loadings		Loading Reductions	
			EPA Cost Study	
	EPA Cost Study	EPA PCS Data	WQBEL #1	WQBEL #2
	lbs/day			
Arsenic	53.56	NR	1.10	1 09
Benzene	0 00	NR	0 00	0 00
Cadmium	5760.89	70.10	5367.95	5622 53
Chlordane	1 17	0.19	0.43	0.80
Chlorobenzene	0 00	NR	0 00	0 00
Chromium III	3 38	NR	0 00	0 00
Chromium VI	15 33	21.77	9.44	10 58
Copper	78598 67	601 36	75664 12	76292 93
Cyanide, free	77.31	18.09	32.84	34 93
Cyanide, total	0 09	834.80	0 00	0 00
4,4-DDT*	0 32	0 10	0.00	0 00
Dieldrin	0.15	0.05	0.10	0.10
2,4-Dimethylphenol	0 00	NR	0.00	0.00
2,4-Dinitrophenol	0 00	NR	0 00	0 00
Endrin	0 00	NR	0 00	0.00
Heptachlor	0 37	0.04	0.11	0.21
Hexachlorobenzene	1 50	1.85	0 17	0.17
Hexachloroethane	0 00	NR	0 00	0.00
Lindane	0.00	NR	0 00	0.00
Mercury	56.58	4.52	38.79	45.89
Methylene Chloride	0.00	NR	0 00	0.00
Nickel	8659 86	665.78	80.27	92.78
Parathion	0 00	NR	0.00	0 00
PCBs	3 16	1.01	0 23	0 41
Pentachlorophenol	6.84	1.92	1.09	2.02
Phenol	0.00	28.92	0.00	0.00
Selenium, total	911.50	12.15	903.51	903.77
2,3,7,8,-TCDD (Dioxin)	00059	0 02	.00056	00056
Toluene	0.67	NR	0 00	0 00
Toxaphene	6 40	0.19	0.05	0 05
Trichloroethylene	27.17	NR	26.11	26.11
Zinc	9225.14	2179.92	1017.05	1048 61

*and metabolites
NR = PCS loadings data not requested by DRI

Sources: Assessment of Compliance Costs Resulting from the Proposed Great Lakes Water Quality Guidance (10); U.S. EPA Permit Compliance System

program (The EPA cost study made an adjustment for bringing facilities up to current standards when estimating costs but not when calculating loading reductions.)

Due to these shortcomings, DRI recommends using the EPA Permit Compliance System data as a more accurate representation of baseline loadings.

Exhibit V-11 compares pollutant loadings and loadings reductions estimated in the EPA study for major point source dischargers based on the difference in permit limits for a sample of 50 facilities with the 1991 discharges calculated by the agency's Permit Compliance System (PCS).

In almost all cases, the loadings estimates from these two data sources differ substantially. With the exceptions of hexavalent chromium, cyanide, hexachlorobenzene, phenol, and dioxin, for which the PCS calculations range from slightly to significantly greater than the cost study estimates, the cost study estimates of loading tend to be much higher than the loads calculated by the PCS. These differences are extremely large for some of the metals, such as cadmium, copper, nickel and zinc, which account for a large majority of the total pollutant load.

The most likely reasons for the greater discharge estimates in the EPA cost study are the use of permit limits to estimate loads and the potential lack of representativeness of the 50 sample facilities.

Exhibit V-11 also shows the reduction in pollutant loadings estimated in the EPA cost study for two water quality based effluent limitations (WQBEL). For WQBEL #1, the permit limits were set equal to the background concentration in the receiving water when negative wasteload allocations were calculated. For WQBEL #2, the limit was set to the most stringent water quality criteria when negative wasteload allocations resulted; thus, this limit is considered to be more stringent.

Because many of the loading reductions estimated in the cost study are larger than the baseline loadings calculated by the Permit Compliance System, their accuracy must be viewed with great suspicion. This is especially true for the metals like cadmium, copper, mercury, and selenium, which the cost study estimates to have some of the largest baseline discharges and greatest reductions in discharges due to the GLI.

3. National Wildlife Federation Study

The National Wildlife Federation (NWF)[8] calculated reductions in loadings for a hypothetical facility in each of the eight Great Lake states. The overall percentage reduction in loadings calculated in this study is comparable to the 81% estimated in the EPA cost study.

This study suffers from the same problem as the EPA cost study: reductions in discharges are based on permit limits rather than actual discharges. Perhaps more importantly, the

8 *Cutting the Poisons: Estimated Reductions in Point Source Loadings of Great Lakes Toxic Pollution from the Great Lakes Water Quality Initiative*, May 11, 1993, National Wildlife Federation/Great Lakes Natural Resource Center.

NWF study examines only one facility and makes the highly unrealistic assumption that all of the wastewater from the hypothetical facility comes from ground water. In addition, very few facilities other than power plants and some sewage treatment plants discharge at rates exceeding 100 cubic feet per second (65 million gallons per day), which is assumed in this study. We are aware of none discharging at this rate whose sole supply of water is ground water or that even have wells capable of producing at this rate.

The assumption about ground water is important because the GLI does not allow the use of intake credits when ground water is the source of the waste water. Therefore, the permit limits calculated in this example are lower than they would be if the intake and receiving water body were the same. For the same reason, the reductions in loadings are greater than they would otherwise be. (The NWF study has also been criticized by the state of Ohio for failing to properly calculate permitted discharges under existing state rules, thereby producing too high a baseline of discharges, which also leads to the overstating of the potential reduction in discharges[9].)

4. Senator Levin's Request to the EPA

The comparison requested by Senator Carl Levin (D, Michigan) in which state permit limits were compared with GLI limits for three hypothetical facilities may provide the most useful illustration of the potential effects of the GLI on permit limits and pollutant loadings. The state permit limits were calculated by personnel in the respective state environmental agencies, who presumably best understand current state regulations and policies. The hypothetical facilities were conceived of by the U.S. EPA, and thus possess a useful degree of realism.

The results of the Levin request to the EPA are repeated for your convenience in Exhibit V-12 for monthly average WQBELs, which give a better indication of the differences in loadings than daily maximums do. Note that the results in Exhibit V-12 are taken from the June 17, 1993 response to Senator Levin, and not a later version (June 28). The earlier version is believed to be a more reasonable comparison because in the later version many state procedures that would result in stricter permit limits were not employed; in addition, permit limits were presented even when analyses revealing reasonable potential to exceed water quality criteria indicated that no permit limits would be necessary.

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9 *Cutting the Poisons: Estimated Reductions in Point Source Loadings of Great Lakes Toxic Pollution from the Great Lakes Water Quality Initiative*, May 11, 1993, National Wildlife Federation/Great Lakes Natural Resource Center.

~~Exhibit V-12~~

Summary of Comparison of GLWQG Limits with State Limits

Pollutant	Monthly Average WQBELs: GLWQG	Range of State Limits: min	Range of State Limits: max	Number of States with No Limit
	micrograms/liter			
Pulp and Paper Mill				
Cadmium	NL	1	3 4	6
Copper	NL	20	30	6
Mercury	1 8E-4*	0.0013	1 5	2
Nickel	NL	-	-	8
PCBs	3E-6*	1 46E-05	0 134	1
Phenol	NL	300	300	7
Selenium	NL	-	-	8
Zinc	NL	180	1387	5
Metal Finisher				
Cadmium	2	5.2	11	2
Chromium VI	16	12	19	4
Copper	NL	47	54	5
Cyanide (F)	8	7 4	23	3
Methylene Chloride	NL	30	32	6
Nickel	195	160	227**	4
PCBs	NL	1.46E-05	0.02	3
Phenol	NL	26	28	6
Toluene	NL	107	180	6
Trichloroethylene	NL	25	25	7
Zinc	318	160**	300	4
Publicly Owned Treatment Works:				
Cadmium	27	10	17	5
Chromium VI	NL	14	16	6
Copper	NL	39	43	6
Cyanide (F)	NL	-	-	8
Nickel	1038	371	371	7
Zinc	NL	52	110	5

*Compliance evaluation levels for these pollutants would be 3 orders of magnitude or more greater

**weekly average limit

Source: Letter to Senator Carl Levin from Tudor Davies (12)

The results summarized in Exhibit V-12 do not show a clear trend in stricter permit limits with the GLI for the three hypothetical facilities. In many cases, GLI procedures would result in no permit limits, while at least some of the state procedures would require limits.

Where the GLI does result in permit limits, the range of state limits generally surrounds the value calculated using the GLI. However, in each case in which the GLI determined that a limit was necessary, the procedures for at least one of the states resulted in no limit being necessary.

When the GLI resulted in permit limits for mercury and PCBs, pollutants for which the GLI establishes wildlife criteria, the limits are much lower than those calculated by the states. The GLI limits for these pollutants, like most of the state limits, are far below current analytical quantification levels, therefore, concentrations used to assess compliance (the compliance evaluation level) would be orders of magnitude greater. In practical terms, until analytical methods improve significantly, the GLI limits would differ little from most of the state limits.

The results of the Senator Levin exercise are consistent with other analyses conducted by the states, which have questioned the additional treatment requirements determined in the EPA cost study. An analysis conducted by the state of Michigan "eliminates essentially all of the compliance costs" estimated by the EPA report to be necessary for facilities in the state to comply with the GLI, because the GLI and Michigan approaches to calculating WQBELs "at existing facilities are quite comparable."[10] If correct, this means that facilities in Michigan would not have to install additional treatment for their wastewaters,[11] but neither would they be reducing pollutant loadings. Because roughly half of the major discharges to the Great Lakes basin are located in Michigan, and a large fraction of pollutant discharges in the basin come from the state, the conclusion reached by the state limit the total reduction in point source discharges achievable by the GLI.

Despite the range of estimates of reductions in loadings to be achieved by the GLI, we can make some judgments about its potential for improving designated uses. We do this by examining how the total loadings of pollutants to the lakes might change as a result of the guidance. Clearly, if no change in loadings results for a particular pollutant, the impairment of beneficial uses by that pollutant will not change. If a reduction in loadings does occur, the question of how beneficial uses might change needs to be answered.

A mass balance model of the behavior of pollutants within the lakes would be useful in making this assessment. Because the application of such a model is beyond the scope of this report, however, we rely instead on an assessment of relative loadings rates, and mass balances performed by others on individual lakes (or parts of lakes) as the basis of our judgments regarding the potential for improvements in beneficial uses.

The actual degree of reduction in loadings will depend on the final form the guidance takes and the interpretation of it. Even if the initial loadings calculated by the EPA cost study

10 *Letter to G. Tracy Mehan, Director, Office of the Great Lakes from James Grant, Chief, Great Lakes and Environmental Assessment Section, Michigan Department of Natural Resources*, June 11, 1993.

11 The "baseline," pre-GLI Michigan standards are currently under challenge in Michigan state courts, and if the stringency of those standards is not upheld, then the difference between existing and GLI treatment costs will be wider. While DRI has not reviewed the merits of the legal dispute, and is thus in no position to comment on the possible outcome, Michigan DNR officials with whom we consulted were confident that their interpretation of the standards would be upheld.

are too high, they are equal for of both the scenarios evaluated. The difference in the degree of loading reductions is due to the difference in calculated permit limits. Thus, implementation procedures such as the strict interpretation of intake credits and the elimination of mixing zones will reduce the level of discharges from the affected facilities, even if in the larger context of discharges to the lakes, as discussed below, the effects are small

5. Effect of the GLI on Drinking Water Would Be Insignificant

As noted above, virtually all of the reported Great Lakes shoreline miles already meet their designated uses for drinking water, and drinking water from the lakes is a minor source of exposure to residents in the basin.[12] The use of activated carbon treatment by municipal drinking water systems that fail to meet regulations for turbidity and coliform bacteria further limits exposure to organic contaminants.[13]

Thus the GLI can make little improvement in the amount of shoreline meeting its designated use for drinking water because there is so little room for improvement. Any reduction in pollutant concentrations in drinking water will be of little significance because pollutant concentrations are found only at very low levels in drinking water, levels below Guidance, which have been established on the assumption of lifetime exposures and wide margins of safety.[14]

6. Effect of the GLI on Swimming Would Be Nonexistent

Little improvement in the degree of shoreline miles meeting designated uses for swimming is possible for the Great Lakes, again because almost all of the shorelines already meet their standards for this designated use. Because the parameters that result in the failure to achieve designated uses for swimming, such as bacteriological contamination and high turbidity levels, are not addressed by the guidance, it will have no direct benefit in increasing the number of shoreline miles available for swimming.

7. Effect of the GLI on Aquatic Life and Fish Consumption Would Be Negligible

Improvements in aquatic life and reductions in fish consumption advisories will result from decreases in the exposure of aquatic flora and fauna to pollutants. Absent complete mass balance modeling results on how exposures to organisms in each lake might change due to

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[12] Environment Canada; Department of Fisheries and Oceans; Health and Welfare Canada; March 1991, *Toxic Chemicals in the Great Lakes and Associated Effects, Synopsis.*
Coburn, Theodora E., Davidson, Alex, Green, Sharon N.; Hodge, R.A. (Tony); Jackson, C. Ian; Liroff, Richard A., 1990, *Great Lakes, Great Legacy?* Conservation Foundation, Washington, D.C., The Institute for Research on Public Policy, Ottowa, Ontario.

[13] Coburn, Theodora E.; Davidson, Alex; Green, Sharon N.; Hodge, R.A. (Tony); Jackson, C. Ian; Liroff, Richard A.; 1990, *Great Lakes, Great Legacy?* Conservation Foundation, Washington, D.C., The Institute for Research on Public Policy, Ottowa, Ontario.

[14] Environment Canada; Department of Fisheries and Oceans; Health and Welfare Canada; March 1991, *Toxic Chemicals in the Great Lakes and Associated Effects, Synopsis.*

implementation of the GLI, we describe the relative loadings of several key pollutants to illustrate how reduced point-source loads might affect concentrations in the lakes.

Estimates of PCB loads to Lake Michigan are listed in Exhibit V-13 Three types of sources are listed in this table point source discharges, atmospheric deposition, and loads associated with the flow of tributaries into the lake

Exhibit V-13

PCB Flows into Lake Michigan

	kg/yr
Point Source Discharges	36
Waukegan Harbor	20.4
Grand Calumet River	199
Lower Fox River	283
Other Tributaries	298
Atmospheric Deposition	113.8
Total	**950.2**

*Includes discharges to tributaries.
Sources: EPA Permit Compliance System, Lake Michigan Lakewide Management Plan; Peck et al., 1993; Eisenreich and Strachan, 1992.

Exhibit V-13 clearly indicates that tributary loads are the largest contributor to loadings in Lake Michigan, accounting for almost 85% of the total, while point source discharges make up less than 4%. Although some double-counting occurs in this table because the tributary loads include point source loadings, that amount cannot be significant. The data for point source loadings includes point source loadings to tributaries. Even if all of the point source loadings were subtracted from the tributary loadings, the total tributary loadings would change little. The principal source of PCBs in the tributary loads is not municipal or industrial point sources, but the transport of sediments contaminated in the past.[15,16]

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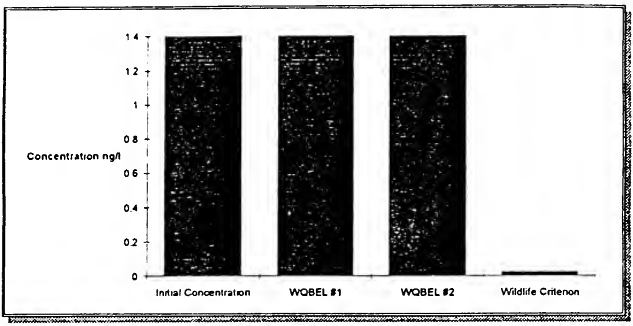
15 HULSEY, BRETT; PECK, JOHN; SAVAGIAN, ANDREW; *Clean Lakes, Clean Jobs: A Case for Cleaning UP Contaminated Sediments to Make the Great Lakes Safe for Industry and Fishing*, Sierra Club Great Lakes Program.

16 ENVIRONMENTAL SCIENCE AND TECHNOLOGY, Vol. 27, No. 7, p 1246, *Science*, 1993.

If the change in PCB concentrations in the Lake Michigan is taken to be proportional to the change in loadings, then the potential decrease in concentrations to be achieved by the GLI in its current form is negligible This is illustrated in Exhibit V-14, which scales a typical concentration of PCBs in the water by the change in loadings predicted to occur in the EPA cost study of 50 sample companies [17] Because of the small contribution of point sources to the lake, and the modest reductions predicted to occur under either of the scenarios evaluated (7.3% and 13% for WQBEL 1 and 2, respectively), the overall change in concentrations is not discernible

Exhibit V-14

Potential Change in Lake Michigan PCB Concentrations Under 2 GLWQG Permit Conditions



Furthermore, even these reductions are most likely overestimates, for as the EPA study notes, the assumption that facilities currently discharge at their permit limits was "primarily the reason that reductions were estimated for pollutants for which production has been banned (e.g. PCB, 4,4-DDT, etc.)."[18]

Similar results would be obtained if the same calculations were made for Lake Superior. Industrial and municipal point sources have been estimated to account for 5%, 6%, and

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[17] Science Applications International Corporation, April 16, 1993, *Assessment of Compliance Csots Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance.*

[18] Science Applications International Corporation, April 16, 1993, *Assessment of Compliance Csots Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance.*

7% of the PCBs, mercury, and lead loadings, respectively, to the lake.[19] Therefore, any loadings reductions projected to occur with the proposed GLI will not be sufficient to bring about major improvements in water quality.

8. Overall Impact on Designated Uses will be Modest

In general, we expect the GLI to be responsible for only very modest improvements in designated uses for aquatic life and fish consumption. In the case of pollutants responsible for fish consumption advisories (as well as effects on wildlife) the compounds believed to be responsible for impairing uses are primarily ones whose production has already been banned.

Mercury and dioxin (an unwanted byproduct) are exceptions to this generalization, but because of the relatively large atmospheric contribution to mercury loadings (see Exhibit V-10), the potential mercury reductions are also minor. For dioxin, which has a minor atmospheric component, reductions in total loadings could be significant if the data from the EPA's permit compliance system are accurate and non-point sources are small. However, even if dioxin loadings are significantly reduced by the GLI, the small reductions in loadings of the other pollutants means that few fish consumption advisories might be removed and only one pollutant affecting fish and wildlife would be addressed.

Clearly, all of the sources of pollutants affecting the lakes must be considered. One way of setting priorities for reducing pollutant loads is to use of mass balance models to predict where the largest benefit of reducing loads can be achieved. Such models could also answer the question of whether minor reductions in point source discharges would even be necessary if the larger non-point sources were controlled.

The oft-stated argument is that all discharges of persistent toxins must be eliminated because the long hydraulic retention time of the Great Lakes basin means they will remain there for decades. However, the time contaminants remain in the lakes actually bears little relationship to the flushing time of the lakes.[20,21] On a practical level, uncritical acceptance of this belief diverts energy and resources from activities that would yield greater improvement in the waters of the Great Lakes.

D. EPA Benefit Valuations Reflect Optimistic Assumptions on GLI Contributions

The US EPA Regulatory Impact Analysis[22] (RIA) reports that, in 3 case studies of particular locations within the Great Lakes Basin, the value of benefits provided by the

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19 Diamond, M.; Mackay, D.; Sang, S.; Vlahos, P.; Voldner, E.; Dolan, D.; 1992, *Mass Balancing and Virtual Elimination*, A Peer Review Workshop at University of Toronto December 7-8, 1992..

20 Environment Canada/Department of Fisheries and Oceans/Health and Welfare Canada, March, 1991, *Toxic Chemicals in the Great Lakes and Associated Effects, Synopsis.*

21 Environment Canada; Department of Fisheries and Oceans; Health and Welfare Canada, March 1991, *Toxic Chemicals in the Great Lakes and Associated Effects, Synopsis.*

22 The "Regulatory Impact Analysis of the Proposed Great Lakes Water Quality Guidance" was conducted for the US EPA by RCG/Hagler, Bailly, Inc., April 15, 1993.

GLI appears to be about the same order of magnitude as the costs. This result, however, arises from arbitrary and quite optimistic assumptions on the proportional contribution GLI would make to an increased *consumer and producer surplus* value of a water body. Specifically, EPA values the environmental benefits of the GLI by either

- obtaining a value for a possible change in water quality, such as from current conditions to a "contaminant free" state, and assigning a portion of that increment to the GLI or
- assessing the value of a water system in its current state and assuming a percentage increase that would result from the GLI.

EPA commonly assumes that GLI might account for as much as 50 per cent of the potential incremental use value of a water body or as much as 20 per cent of the current use value. However, data on loadings, as noted above, suggest that GLI would have effects at least an order of magnitude less.

Most of the benefits identified in the EPA study arise from increased water body use for recreational fishing, commercial fishing, or wildlife observation, and from higher non-use (or ecological) value. The study computes the GLI contribution to non-use value as 50 per cent of its contribution to use value. Thus, the full valuation of benefits hinge on the assumptions determining the contribution to the use value of a water body.

Not all the benefits estimated by the procedures just described can realistically be expected to occur instantaneously. Thus, EPA alternatively assuming a phasing in to full benefits over 10 and 20 years.

Lower Fox River Case Study. The EPA study estimates that, in the Lower Fox River watershed, the GLI would add benefits valued at 3 to 12 million (1992) dollars annually, with .9 to 5.7 million coming from increased recreational fishing, .2 to .3 million from commercial fishing, 1.3 to 1.8 million from wildlife observation, and .5 to 3.7 million from nonuse valuation. These values assume that the GLI would account for

- 50 per cent of potential incremental value from increased trout and salmon sports fishing,
- 20 to 100 per cent of potential incremental value from greater yellow perch sports fishing, and
- 5 per cent greater value from wildlife observation.

Saginaw River and Bay Case Study For Saginaw River and Bay, the EPA study estimates that the GLI would contribute benefits totaling 1.9 to 16.7 million (1992) dollars annually. The overall benefits reflect a 0.9 to 8.1 million value for enhanced recreational fishing, 0.2 to 0.7 million from increased commercial fishing, .1 million from better waterfowl hunting, and .2 to .7 million from wildlife observation. These values assume that the GLI would contribute

- 50 per cent of the potential value increase from recreational fishing,
- 10 per cent greater value from commercial fishing,
- 10 per cent greater value from waterfowl hunting, and

- 5 to 10 per cent greater value from wildlife observation

Black River Case Study The EPA study estimates that, by enhancing the fishing and swimming in the Black River, the GLI would add benefits totaling from 1 to 1.2 million (1992) dollars annually The values in this case build upon an earlier study of the benefits of transforming the Black River from its current state in 1982 to "fishable" water quality [23] The EPA study assumes that, as compared with the total benefits of moving from 1982 water quality to fishable water quality, the GLI contributions would account for

- 1 to 5 per cent as much value from better recreational angling and
- 1 to 5 per cent as much value from recreational boating.

As shown in Exhibit V-15, the EPA cost estimates for the three case studies lie within the range of benefits for two of the cast study sites, and exceeds the maximum estimated benefits by a factor of ten for the Black River site Because the site-specific approach may overlook benefits accruing to residents elsewhere on the lakes, and because the monetization of environmental benefits is an art more than a science, these results, if taken on their own, would not indicate an alarming imbalance between costs and benefits.

However, the costs used here are based on the EPA Cost Scenario #2, which is one-tenth as large as DRI's worst-case cost scenario (A-High). When compared to those larger estimates, the EPA benefit estimates confirm the main conclusion of this report, that if the GLI provisions causing potential "cost spikes" are not modified, there is a danger that the costs of the GLI will far exceed reasonable ranges of benefit measures.

E. An Ecosystem Approach to Regulation?

The EPA describes the Great Lakes Water Quality Guidance as taking an ecosystem approach to the regulation of toxins. The reason for this description seems to be that for the first time, federal guidance on water quality contains criteria for the protection of animal species that do not live in the water but are nevertheless exposed to toxins in the water through their diet. While such an approach is certainly needed, it is debatable whether it can be considered novel, or to what degree it really represents and ecosystem approach. Traditionally, one of the criteria established for water quality has been the protection of human health from adverse effects of eating fish in contaminated waters, which like wildlife, accumulate certain toxins in their fat or flesh. What is new about the guidance is that it considers effects on fish consumers others than humans, namely several species of birds and mammals.

Unfortunately, the approach taken by the guidance looks at only one part of the ecosystem, the accumulation of contaminants through the food chain. A true ecosystem approach would fully consider all sources and fates of contaminants in the Great Lakes basins, as well as its biological and physical characteristics. This is much closer to the approach taken in Lakewide Area Management Plans (LAMPs). Because the LAMPs focus on only one lake each, they might be considered less comprehensive than an

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[23] *An Economic Assessment of the Benefits of the Final Effluent Limitations Guidelines for Iron and Steel Manufacturers*, US EPA/OPA, 1982

ecosystem analysis of the entire basin However, the large differences in physical and biological characteristics among the lakes may make them a more reasonable unit for ecosystem analysis

Exhibit V-15

Case Study Benefit Cost Results for Great Lakes Water Quality Guidance[2] (Millions of 1992 [first quarter] dollars per year)

Benefit Category	Case Study Site		
	Fox River/ Green Bay	Saginaw Bay	Black River
Recreational Fishing	0.9 - 6.1	0.9 - 8.1	0.1 - 0.6
Recreational Boating and Swimming	+	+	0.0 - 0.1
Subsistence Fishing	+	+	+
Commercial Fisheries	0.2 - 0.3	0.2 - 0.7	
Waterfowl and Other Hunting	+	0.1 - 0.1	+
Nonconsumptive Use	1.3 - 1.8	0.2 - 0.7	+
Human Health Benefits	+	+	+
Nonuse/Ecologic Values	0.5 - 3.7	0.5 - 7.1	0.0 - 0.6
Total Benefits	2.9 - 11.9	1.9 - 16.7	0.1 - 1.2
Annualized Costs[b]	5.1	6.0	12.0

+ Positive benefits anticipated, but not estimated in monetary terms.

[a] See body of report for explanation of assumptions employed to attribute benefits to the Guidance, and their application to specific benefit estimates.

[b] Source: SAIC 1993, Cost Scenario 2.

Note: Numbers may not add to total due to rounding.

Reproduced from EPA Regulatory Impact Analysis (RCG/Hagler, Bailly, Inc.), 1993

The failure of the guidance to take a true ecosystem approach may best be illustrated in the establishment of a the wildlife criterion for mercury. As a naturally occurring element, mercury would be expected to be present in all water bodies. This raises the question of its concentration would be in an unpolluted environment and what the proper water quality criterion should be. The guidance back-calculates an acceptable concentration using a dose that does not cause adverse effects on wildlife and a bioaccumulation factor to relate the concentration in water to the concentration in the food of the wildlife.

There are several problems with the criterion calculated in this way. While methyl mercury is the form of primary concern, the water quality criterion is based on all forms of mercury regardless of their relative toxicity. A large degree of uncertainty surrounds the magnitude of the bioaccumulation factor which is used to calculate the water quality criterion, to such a degree that the proposed criterion is lower than what the concentration would be in a pristine environment.

For a relatively pristine lake, expected mercury concentrations have been cited by one source to range from 0.4 to 0.8 ng/l (17), compared to the GLI wildlife criterion of 0.18 ng/l. Mercury concentrations in Lakes Superior and Huron, the cleanest of the Great Lakes, measured at <6.2 and 4.9 ng/l, respectively (2). Atmospheric deposition of mercury to the lakes is a far larger source than municipal and industrial discharges, yet preindustrial deposition rates have been estimated to be 30% of their current levels. When natural inflows from tributaries and ground water are added to the natural rates of atmospheric deposition, it seems unlikely that the concentrations in the lakes ever was or ever will be as low as the wildlife criterion proposed in the GLI, even in the absence of anthropogenic inputs.

The use of an ecosystem approach that includes the mass balance modeling of contaminants in the lakes could serve would serve two important purposes. For naturally-occurring compounds, mainly the metals, it would provide needed information on how natural flows compare with those due to man's activities. For all of the pollutants, it would indicate the relative significance of pollutant sources and the effectiveness of control strategies to enhance the ecosystems of the lakes. Combined with information on the costs of the various control strategies, it would point toward the most cost-effective solutions to the problems of toxic pollutants in the Great Lakes.

Appendix A. DRI/McGraw-Hill Model of the Great Lakes Economy

Overview

The DRI/McGraw-Hill model of the Great Lakes regional economy represents a new generation of regional models. The model is a dynamic system of over 1,400 equations describing the economic structures and linkages of the eight Great Lakes states It is multidimensional, integrating the structural detail of interindustry relationships across eight states into an econometric model of regional competition and growth. This dynamic approach captures the interactions between production, employment, incomes, wages, industry costs, demographic forces, housing markets, and government finance in each of the eight states The modeling structure is flexible, providing policy makers with a comprehensive and consistent framework for assessing the economic impacts of their policy choices

The Great Lakes Regional Model is linked to the DRI/McGraw-Hill Quarterly Model of the U.S. Economy, incorporating national variables as basic drivers of economic activity within the eight states. The influence of national forces is shaped by state-specific conditions of demographics, industry mix, income and expenditure patterns, and relative cost structures. Each state's changing competitive strengths and weaknesses determine its success in capturing a share of the national market. Like the U.S. Model, the Great Lakes Regional Model operates at a quarterly frequency.

Theoretical Foundations and Innovations

According to the economic base (export base) theory of regional development, a region's economic growth is enhanced by the sale of its goods and services to markets outside the state. By exporting, industries generate new income and wealth which, in turn, promotes the expansion of sectors of the economy that serve primarily local markets. As described in the accelerator/multiplier theory, business investment increases as the capital stock adjusts to changes in output and employment. New job opportunities also attract an in-migration of population, increasing the demand for new housing.

The ability of the economy to sustain higher growth is, however, constrained by competitive forces captured in the model. The entry of new workers into the labor force lags behind the gains in employment, causing labor markets to tighten. The resulting upward pressure on wage rates contributes to a general acceleration in each state's consumer price level. Higher operating costs for businesses and higher living costs for residents move the economy back toward a trend rate of growth, although altered by the new industry structure.

This dynamic process represents a departure from the simple export base theory. The multiplier response to an initial stimulus is not constant, but rises initially with higher consumption and investment and then falls as resource constraints and cost pressures impair each state's competitive position. Moreover, the response to an economic stimulus

will vary across industries and states, depending on their technologies, cost structures, and interindustry purchasing relationships. Part of the income created by export sales will be spent on goods and services provided by firms outside the state; this leakage diminishes the export multiplier

The industrial structure of the Great Lakes Regional Model embodies several innovations in regional modeling, including the incorporation of explicit cost measures and interindustry demands. For 20 manufacturing industries and eight states, the model determines constant-dollar (real) shipments, employment, wage rates, wage and salary income, and an input cost index. The eight nonmanufacturing sectors include all variables except real shipments.

In constructing the model, DRI/McGraw-Hill utilized its proprietary quarterly database of real industry shipments by state. DRI has developed this database from five-year and annual Census Bureau surveys. With limited degrees of freedom, the equation structures are simple yet powerful. For each industry, a state's share of national production is driven by its input costs, interindustry generated demand (within the state and/or the Great Lakes region), and tax rates--all expressed relative to the nation's. In some industries, relative income, population, or final demand measures are also included.

The set of interindustry generated demand variables is unique and captures a supplying industry's potential sales to other industries within the state or region. Purchase coefficients, expressed as a percentage of purchasing industries' output, are derived from DRI/McGraw-Hill's Interindustry Model and vary over time as technologies and industry structures change.

The Great Lakes states, like other regions, have clusters of interdependent firms in related industries. Some firms will sell their products outside the region, while supporting firms will provide raw materials, components, and support services. For example, the lumber industry will benefit from an increase in shipments of paper or furniture, while the demand for steel will increase with sales of machinery or transportation equipment by firms within the region. The interindustry generated demand variables within the Great Lakes Regional Model capture these cluster relationships.

Another important feature of the model is the explicit representation of industry costs. Each industry cost index has four components--wages, the rental price of capital, electricity costs, and material costs. DRI/McGraw-Hill's Factor Input Margin model was used to determine the contribution of different factors of production to total input costs by industry at the national level. The weights applied to the four factor inputs vary over time with shifts in technology and production processes. The cost indexes capture regional variations in industry wage rates and electricity prices. Although the model was estimated using national measures of capital and material costs, regional variations can be introduced in impact simulations. For example, the financing costs of investments to meet water quality standards can be introduced through each industry's capital cost index. The model can then be solved to determine impacts of the change in capital costs on industry shipments and employment, incomes, consumer prices, population, and construction activity.

Model Structure

Industrial Production

The Great Lakes model projects the real value of shipments in 20 manufacturing industries, defined at the two-digit Standard Industrial Classification (SIC) level The primary source for historical data on nominal shipments by industry is the Bureau of the Census, U S Department of Commerce These nominal shipments are then deflated by the U S. producer price indexes (rebased to 1987=1) for the corresponding two-digit SIC industries to obtain real shipments in constant 1987 dollars. Monthly producer price data are available from the Bureau of Labor Statistics for the nation as a whole, but not for individual states. For each industry, annual real shipments are then distributed to a quarterly frequency using the profile of each state's employment multiplied by the national ratio of real shipments to employment.

The Great Lakes regional model combines the industry shipments database with DRI's Interindustry Model to construct a powerful set of equations linking potential supplier production to changes in purchaser activity. These equations link one industrial sector to another by insuring that suppliers share in the growth of their principal end-markets.

More deterministic input/output structures apply fixed regional purchase coefficients in deriving a local area input/output matrix. In contrast, DRI/McGraw-Hill's Great Lakes model uses generated interindustry demand variables, while maintaining the desirable competitive features of a behavioral model. Rather than assigning weights mechanically, we use these interindustry demand variables as explanatory factors in the estimation of industrial shipments equations. These econometric equations yield a coefficient on the interindustry demand variable which indicates for each industry the degree to which local suppliers satisfy local end-market demand.

A sample interindustry demand equation for Great Lakes' industry **j**, which principally sells to industries **x**, **y**, and **z**, is as follows:

$$GQ_{jGL} = B_{jx} * Q_{xGL} + B_{jy} * Q_{yGL} + B_{jz} * Q_{zGL}$$

GQ represents interindustry demand for industry **j**, and **Q** represents output of industries **x**, **y**, or **z** in the eight Great Lake states (**GL**). The coefficients $\mathbf{B_{jx}}$, $\mathbf{B_{jy}}$, and $\mathbf{B_{jz}}$ measure purchases from industry **j** as a percentage of total output in industries **x**, **y**, and **z**. These shares are determined exogenously using DRI's Interindustry modeling system. The shares change over time, according to the evolving input-output relationships projected by DRI's Interindustry Service. The model includes interindustry generated demand variables for each state and the Great Lakes region. The relative importance of state versus regional end-markets is determined in the estimation of econometric equations. Michigan's rubber and plastic industry shipments, for example, are driven by generated demands of Michigan industries, reflecting the dominant role of the state's automotive industry. On the other hand, Indiana's rubber and plastic industry depends interindustry generated demand from end-markets throughout the Great Lakes region.

Total output in each manufacturing industry is modeled as a function of several explanatory variables. Each concept is expressed as its state value relative to its national

value, measuring the competitiveness of each state economy. A state's share of the national market in a given industry thus depends on relative interindustry demand, relative "final demand," relative production costs, and relative business tax rates. "Final demand" is represented by state's or region's share of national income or population. Production costs include the industry's wage rate, the rental price of capital, electricity prices, and the wholesale price of intermediate materials. The basic functional form for the shipments equations for state **R** is.

$$Q_{iR} / Q_{iUS} = f(GQ_{iGL} / GQ_{iUS}, FD_{iR} / FD_{iUS}, COST_{iR} / COST_{iUS}\ TB_{R} - TB_{US})$$

where
Q_{iR} represents state shipments in industry i;
Q_{iUS} is national shipments in industry i;
GQ_{iGL} and GQ_{iUS} are the interindustry generated demand measures for industry i in the Great Lakes and the U.S.;
$COST_{iR}$ and $COST_{iUS}$ are production cost indexes for industry i;
and TB_{R} and TB_{US} represent business taxes as a share of personal income.

In many cases, the state-specific interindustry demand variable (GQ_R) replaces the Great Lakes variable. Final demand terms (which represent consumer spending, government purchases, investment, and exports) do not enter the shipments equation for every industry because some industries produce goods almost entirely as inputs to other industries.

Industry-specific shipments are then used to determine employment by state in 20 manufacturing industries. Total manufacturing shipments affect employment in mining; wholesale and retail trade; and transportation, communications, and public utilities.

Employment

The Great Lakes model projects state-level employment in 20 manufacturing industries and eight nonmanufacturing industries. Manufacturing employment is modeled at the two-digit SIC code level of detail, while nonmanufacturing employment roughly follows a one-digit classification. The U.S. Department of Labor's Bureau of Labor Statistics (BLS) is the primary source of employment data. Monthly series are seasonally adjusted and converted to a quarterly frequency.

The Great Lakes model uses industry shipments, national labor productivity, and relative wage rates to estimate manufacturing employment by state for 20 industries. Equations are estimated in log-linear form. Employment is primarily a function of each state's real shipments and national labor productivity, but is also affected by cost considerations. The ratio of a state's manufacturing wage rate to the nation's captures regional variations in labor productivity. High-wage states, for example, are likely to be characterized by high capital-to-labor ratios and high labor productivity. The ratio of industrial wage rates relative to the industry's total cost index (including capital, energy, and material costs) captures substitutions between labor and other factors of production, such as capital and energy. The general form of the manufacturing employment equations is as follows:

$$E_{iR} / Q_{iR} = f(Q_{iUS} / E_{iUS}, RW_{iR} / RW_{iUS}, RW_{iR} / Cost_{iR})$$

where
E_{iR} *is employment in industry i in Great Lakes state R,*
Q_{iR} *is output in industry i in Great Lakes state R,*
Q_{iUS} / E_{iUS} *is output per worker nationally in industry i,*
RW_{iR} / RW_{iUS} *is the state's wage rate relative to the nation's in industry i, and*
$RW_{iR} / COST_{iR}$ *is the state's wage rate relative to total costs in industry i.*

The model determines nonmanufacturing employment in eight sectors, listed in order of size. services, wholesale and retail trade; state and local government, finance, insurance, and real estate, transportation, communications, and utilities; construction, federal government; and mining. While these sectors sell primarily to local markets, they also serve markets outside the state. Thus, nonmanufacturing employment is subject to the forces of regional competition.

Each nonmanufacturing employment equation has a unique specification to reflect the different drivers of each sector. The dependent variable is the ratio of state employment to national employment in a given sector. Key explanatory variables are expressed as state-to-nation ratios. Equations are estimated in log-linear functional form.

The key determinant in most nonmanufacturing employment equations is real discretionary income, which represents consumers' purchasing power. Discretionary income is total personal income less tax payments, utility consumption, and saving. Tax payments subtracted from personal income include not only personal taxes but individual payments of sales and property taxes. Each state's nominal discretionary income is then deflated by a state-specific consumer price index (CPI). Thus, an increase in a state's CPI will reduce real income, leading to weaker demand for goods and services and lower employment in nonmanufacturing industries.

In the state and local government sector, real income reflects both demand for public services and revenue-raising capacity. In some equations, state and local tax revenues directly influence government employment. Population, rather than income, is the dominant explanatory variable in equations for federal government employment.

Employment in most nonmanufacturing industries is also affected by each state's wage rate relative to the nation's. The difference between a state's effective state and local business tax rate and the nation's influences employment in services, trade, and finance. The business tax rate is defined as the sum of business payments for corporate, sales, and property taxes divided by total personal income.

Employment in construction is driven by real investment in structures, population, and relative wage rates. Real investment in structures has two components -- residential (determined by housing starts and real discretionary income) and nonresidential (determined by non-construction employment). Housing starts, in turn, are modeled as a share of the nation's and are driven by relative changes in population and levels of real discretionary income. Measures of construction activity also affect employment in finance, insurance, and real estate.

Finally, mining employment is driven by total manufacturing shipments, investment in structures, and the mining industry's relative costs

Incomes

The Great Lakes model projects total personal income and its components for all eight states Historical data is provided by the U S. Department of Commerce, Bureau of Economic Analysis' Survey of Current Business and other unpublished materials Personal income is the sum of three sets of concepts:

Total Personal Income =
Wage and Salary Disbursements +
Nonwage Taxable Income +
Nontaxable Income

In each industry, wage and salary disbursements are the product of average annual wage rates and employment. Total wage and salary income is summed over the 20 manufacturing and eight nonmanufacturing industries in each Great Lakes state.

Nonwage taxable income breaks down further:

Nonwage Taxable Income =
Dividends, Interest, and Rent +
Proprietors' Income +
Residence Adjustment -
Personal Contributions for Social Insurance

For each Great Lakes state, dividends, interest, and rent are estimated as a share of the nation's. The explanatory variable is the ratio of each state's total personal income to the nation's in previous periods.

Nonfarm proprietors' income represents the earnings of self-employed individuals. The state/national ratio of nonfarm proprietors' income is modeled as a function of lagged moving averages of the states' share of U.S. personal income or wage and salary disbursements.

Farm proprietors' income is the net profits of unincorporated farms, reflecting cash receipts for crops and livestock minus expenses. In the model, each state's farm income is driven by national farm income and state's consumer price index relative to the nation's.

Personal contributions for social insurance include individual payments toward social security and government pensions and are estimated as a share of Great Lakes' wage and salary disbursements. Determinants are the U.S. ratio of social insurance contributions to wage and salary income, as well as each state's average wage rate relative to the nation's.

The residential adjustment is a measure of commuter income, defined as the difference between labor income earned by residents employed out-of-state and income earned by nonresidents working in the state. It is determined by wage and salary disbursements, other labor income, and personal contributions for social insurance in the Great Lakes region (positively) and in the specific state (negatively).

Nonwage nontaxable income breaks down into two components:

Nonwage Nontaxable Income =
Transfer Payments +
Other Labor Income

Transfer payments include payments to individuals for social security, welfare benefits, Medicaid, Medicare, unemployment insurance, and pensions of retired government workers. For each Great Lakes state, transfer payments are determined by the state's population and U S per capita transfer payments from federal, state, and local governments

Other labor income is defined as nonwage labor income, including fringe benefits such as health insurance and private contributions to retirement plans. Other labor income is estimated as a share of each state's total wage and salary disbursements. Explanatory variables include the U.S. ratio of other labor income to wage and salary disbursements, along with each state's average wage rate relative to the nation's.

In the Great Lakes model, personal income is key factor driving housing activity, tax payments, and employment in several nonmanufacturing sectors. As a measure of "final demand," personal income also is a determinant of production in several manufacturing industries. The concept used production and employment equations is "real discretionary income" defined as total personal income excluding taxes and saving, and adjusted for inflation using each state's consumer price index.

Prices and Costs

To capture the Great Lakes states' competitiveness relative to the rest of the nation, the model includes several indicators, including consumer price indexes, wage rates, electricity prices, material costs, and capital costs.

Wage Rates

The model projects average wage rates by state in all 20 manufacturing and eight nonmanufacturing industries Wage rates are defined as annual wage and salary payments per worker, expressed in thousands of dollars. The primary source for wage rate information is the U.S. Department of Commerce, Bureau of Economic Analysis' Regional Economic Measurement Division. Wage rates are computed by simply diving wage and salary disbursements by employment.

In many industries, a state's wage rate relative to the nation's is determined by an average of past relative consumer prices, reflecting the price expectations that underlie wage claims. Thus, price expectations adapt gradually to the recent history of inflation. In order to retain and attract employees for a given level of output, employers must maintain real, or inflation-adjusted, wage levels. To capture the effects of labor market tightness on wage rates, several equations include the difference between the state and national unemployment rate

The interaction between rising wages and prices in the model generates a mild wage-price spiral that is dampened as higher wage rates adversely affect each state's competitive position (reducing labor demand) and draw more workers into the labor force (increasing

labor supply). A slackening labor market then puts offsetting downward pressure on wages

Wage rates determine total wage and salary disbursements in the state, which comprise over half of total personal income. In addition, wage rates are an important component of industry cost indexes, which determine an industry's cost competitiveness and demand for its products. An industry's relative wage rate directly affects its employment, as high relative wages are associated with high labor productivity

Input Costs

In order to more accurately capture the competitive effects of increased input costs on industrial production, DRI has constructed a set of input cost indexes that fully integrate national and regional industry cost information. Wage rates alone do not fully describe the comparative advantage (or disadvantage) of firms in a particular industry. Energy, material, and capital costs, as well as their factor contributions to total input costs, also play important roles.

DRI's Factor Input Margin (FIM) model uses input-output analysis to determine the contribution of different factors of production (labor, capital, materials) to total input costs by industry at the national level. The FIM model is a component of DRI's regularly maintained interindustry data base. Over time, the factor proportions of total input costs change with shifts in technology and evolving interindustry relationships. DRI forecasts these factors' contributions for 82 industries, which then may be aggregated for analysis at the two-digit SIC code level.

Using the national proportions of industry input costs, state industrial cost indexes are constructed by using state-specific factor prices. In order to construct an industry's cost index, factor prices are simply indexed to their 1987 values and then weighted by their shares of input costs. Electricity prices reflect energy input costs, wage rates reflect labor costs, the rental price of capital reflects capital costs, and changes in a broad index of producer prices reflect material costs.

The state-specific information in wages and electricity prices provides a foundation for analyzing how input costs are rising (or falling) relative to the nation and provides richer detail for describing the competitive position of a state's industry. In the historical database and the baseline projections, the capital and material costs terms do not vary across states. However, variations are introduced in the forecast simulations to capture the direct capital costs of investments to reduce water pollution and the resulting indirect increases in region's material costs (paper, steel, etc.).

Industry input costs are directly employed in the specification of manufacturing shipments. In this manner, changes in relative input costs help determine regional shifts in industrial production.

Consumer Prices

DRI constructs consumer price indexes for the states utilizing CPIs reported by the Bureau of Labor Statistics for 27 metro areas and four Census regions. This is necessary because the BLS does not report CPIs at the state level. Since not all metro area price

indexes are reported each month, DRI has interpolated between data points. The complete monthly data are then seasonally adjusted and converted to a quarterly frequency The Pennsylvania index, for example, is a weighted average of the Philadelphia, Pittsburgh, and Northeast regional CPIs Weights for the two metro areas are based on their respective shares of Pennsylvania's population, prices for the remainder of the state follow the regional CPI

Each state's consumer price index is forecast as a function of the national consumer price index, and weighted relative changes in electricity costs and wage rates. While all components of the consumer price index cannot be modeled directly, relative movements in wage levels provide a good proxy for changes in omitted consumer prices.

Each state's consumer price index plays an important role in the model's dynamics Discretionary income measures are deflated by the consumer prices to gauge changes in "real" income. Real income changes drive employment growth in most nonmanufacturing sectors and several manufacturing industries. Consumer prices also play a role in determining nominal wage rates.

Demographics

The model includes projections of the total population in each of the eight Great Lakes states The U.S. Department of Commerce, Bureau of the Census is the primary source of demographic data. The total population series is distributed from an annual to a quarterly basis and constrained across all states to the national population series developed by DRI's U.S. Economic Service.

The principal determinant of regional population growth is employment growth People tend to follow jobs, explaining migration to rapidly expanding regions. Other factors contributing to migration across state boundaries include wage rates and per capita incomes Time trends and the share of U.S. population aged 65 and over capture the trend towards retirement in the sun belt.

Population is used as a measure of demand in several of the model's employment equations, real shipments of the printing and publishing industry, government transfer payments to individuals, and home-building activity.

Labor Market

The Great Lakes model projects each state's labor force, employment, and unemployment rate, as measured in the Bureau of Labor Statistics' household survey of employment by state This household survey differs from the establishment survey that is used in the model's payroll employment equations. The household survey corresponds to place of residence and captures the proprietors and self-employed who are not included in the establishment count Moreover, the household survey counts the number of workers, while the establishment survey counts the number of jobs in the state. Thus, persons holding more than one job are treated differently in the two surveys. The series are seasonally adjusted and converted to a quarterly frequency.

Each state's labor force is a function of the national labor force, payroll employment relative to the nation's, which captures the availability of jobs for new entrants; and real per capita discretionary income growth, which captures changing consumer confidence and households' needs to find new sources of income. Each state's share of national employment by place of residence is determined by the state's payroll employment relative to the nation's. Unemployment rates are determined from the labor force and employment as a simple identity.

The unemployment rate is a critical barometer of consumer confidence and an important determinant of housing activity and home prices. As a measure of labor market tightness, the unemployment rate also helps to determine wage rate growth in several industries.

Appendix B. Selected Tables

Compliance Costs and Regional Economic Impact

This appendix begins with three tables reproduced from Science Applications International Corporation's GLI report ("the EPA cost study"), followed by tables showing detailed cost breakdowns that were inputs to and outputs from the DRI model (discussed in Chapter IV)

Exhibit B-1

Distribution of Major Dischargers in the Great Lakes System by Industrial Category

Industrial Category	Total Number of Facilities
Mining	14
Food and Food Products	12
Pulp and Paper	54
Inorganic Chemicals	19
Organic Chemicals/Petroleum Refining	28
Metal Manufacturing	37
Metal Finishing	31
Steam Electric	50
Miscellaneous	27
Publicly Owned Treatment Works	316
Total	588

Source: Data contained in the EPA Permit Compliance System (PCS) for the year 1990

The Table on this page is reproduced from SAIC, 1993

Exhibit B-2

Summary of Annualized Compliance Costs
($ Millions; 1st Quarter 1992 Dollars)

Discharge Categories	Cost Scenario 1	Cost Scenario 2	Cost Scenario 3	Cost Scenario 4
Direct Dischargers - Major Industrial	$37.4	$61.1	$61.5	$88.5
Direct Dischargers - Major Municipal	$5.1	$41.2	$348.9	$353.5
Direct Dischargers - Minor	$10.5	$10.5	$10.5	$10.5
Indirect Dischargers	$26.5	$79.5	$53.0	$53.0
Total Costs	**$79.5**	**$192.3**	**$473.9**	**$505.5**

(Source: Science Applications International Corporation, *Assessment of Compliance Costs Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance*, April 16, 1993

The Table on this page is reproduced from SAIC, 1993

Exhibit B-3

GLI Compliance Cost Estimates for Direct Dischargers - Scenario 2

Category	Total Plants/Group	Annualized Costs by Category ($)						Group Cost as % of Total Cost	Average Animal Cost per Plant ($)
		Capital	Annual Monitor	Annual O&M	Special Monitor	Minim. Studies	Total		
Mining	14	28,041	34,020	19,299	34,171	0	115,531	0 1%	8,252
Food	12	0	51,240	0	23,757	227,579	302,576	0 3%	25,215
Pulp & Paper	54	449,459	183,699	577,611	130,9[illegible]	15,111,454	16,453,139	14 6%	304,688
Inorganic Chemicals	19	206,202	53,388	1,371,040	22,638	289,636	1,942,904	1 7%	102,258
OCPSF/Refining	28	6,786,545	143,456	15,230,267	161,81[illegible]	8,004,652	30,326,732	26 9%	1,083,098
Metals Mfrs	37	81,955	125,040	210,067	18,509	1,204,276	1,639,847	1 5%	44,320
Metal Finishing	31	107,407	108,388	1,608,982	45,988	1,066,407	2,937,173	2 6%	94,748
Steam Electric	50	14,832	213,606	105,000	74,748	1,320,793	1,728,979	1 5%	34,580
Miscellaneous	27	292,087	80,973	4,476,000	79,233	780,402	5,708,695	5 1%	211,433
Municipal	316	0	1,592,912	6,313,333	657,737	32,635,010	41,218,992	36 5%	130,440
Subtotal	588	7,966,529	2,586,722	29,931,599	1,249,509	60,640,209	102,374,567	90 7%	174,106
Minors									
Municipal	927	0	2,252,610	0	1,880,771	0	4,133,381	3 7%	4,459
Non-Municipal	2280	0	5,540,400	0	779,090	0	6,319,490	5 6%	2,772
Subtotal	3,207	0	7,793,010	0	2,659,861	0	10,452,871	9 3%	3,259
Total	3,795	7,966,529	10,379,732	29,931,599	3,909,370	60,640,209	112,827,438	100 0%	29,731

Note: Costs are in first quarter 1992 dollars.

(Source: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, *Assessment of Compliance Costs Resulting from Implementation of the Proposed Great Lakes Water Quality Guidance*, April 16, 1993

The Table on this page is reproduced from SAIC, 1993

Exhibit B-4

Loss in Manufacturing Output for Great Lakes Region
DRI Scenarios for 1997-2017

(Millions of 1992 Dollars)

	Scenarios			
Year	A-High	A-Low	B-High	B-Low
1997	116	30	20	3
1998	697	181	118	16
1999	1,427	372	242	34
2000	2,138	557	362	51
2001	2,836	738	480	67
2002	3,508	913	594	83
2003	4,155	1,082	703	98
2004	4,580	1,192	775	108
2005	4,694	1,222	795	111
2006	4,723	1,230	800	112
2007	4,757	1,239	805	113
2008	4,758	1,239	805	113
2009	4,747	1,236	804	112
2010	4,737	1,233	802	112
2011	4,737	1,233	802	112
2012	4,737	1,233	802	112
2013	4,727	1,231	800	112
2014	4,711	1,226	798	111
2015	4,695	1,222	795	111
2016	4,688	1,221	794	111
2017	4,685	1,220	793	111

Exhibit B-5

DRI Forecast of Base Manufacturing Output and Changes Due to GLI for All Scenarios Year 2005

(Million of 1992 Dollars)

	Base Level of Mfg Output	Change in Output due toGLI			
		Scenarios			
		BLOW	BHIGH	ALOW	AHIGH
Food & Prod.	150,557	-10	-69	-88	-337
Tobacco Products	124	0	0	0	0
Textile Mill Products	5,816	-1	-4	-6	-19
Apparel	22,151	-1	-7	-10	-37
Lumber and Wood	22,696	-2	-14	-30	-76
Furniture & Fixt	22,215	-1	-6	-9	-35
Paper & Prod	53,937	-7	-37	-217	-309
Print & Pub	97,684	-8	-61	-65	-259
Chemicals	105,499	-13	-67	-100	-425
Petroleum and Coal	32,660	-3	-14	-26	-86
Rubber & Plas	71,655	-5	-35	-47	-169
Leather & Products	1,564	0	-1	-2	-6
Stone, Clay & Glass	30,060	-2	-14	-17	-67
Prim. Metals	68,872	-7	-53	-84	[illegible]46
Fab. Metal Prod	97,464	-6	-43	-51	-196
N.E. Mach.	183,260	-13	-100	-123	-493
Elec. Mach.	105,846	-8	-63	-76	-291
Trans	244,569	-17	-136	-194	-744
Instrmnts	57,962	-7	-57	-62	-242
Misc	16,932	-2	-13	-14	-56
TOTAL	1,391,522	-111	-795	-1,222	-4,694

Exhibit B-6

Loss in Manufacturing & Outputs by State and Mfg. Sector: Scenario A-High

(Millions in 1992 Dollars)

Sector \ State	IL	IN	MI	MN	NY	OH	PA	WI	Total
Food and Products	64	10	9	10	117	5	38	85	337
Tobacco Products	0	0	0	0	0	0	0	0	0
Textile Mill Products	2	0	1	0	4	3	7	3	19
Apparel	2	2	6	0	26	0	2	0	37
Lumber and Wood	4	16	7	2	16	1	9	20	76
Furniture & Fixt.	7	3	12	0	4	5	1	4	36
Paper & Products	6	12	144	15	71	29	1	30	309
Printing & Publishing	11	18	23	21	152	14	3	18	259
Chemicals	11	56	156	2	152	28	1	19	425
Petroleum and Coal	26	13	8	7	4	25	0	3	86
Rubber & Plastics	12	22	23	6	46	14	20	26	169
Leather & Products	1	0	0	0	2	0	0	2	6
Stone, Clay & Glass	5	8	23	3	11	11	2	4	67
Primary Metals	45	188	275	2	211	99	17	10	846
Fabricated Metal Products	23	27	41	11	39	14	14	26	196
Non-electrical Machinery	26	71	66	49	138	16	1	126	493
Electrical Machinery	9	61	27	12	113	23	5	42	291
Transportation	60	119	368	4	78	56	38	32	744
Instruments	3	12	13	13	159	8	17	17	242
Misc	1	4	6	0	34	5	1	5	56
Total	316	643	1,198	158	1,375	357	176	471	4,694

Note. Sectors are by 2-digit SIC codes

Exhibit B-7

Loss in Real Income by State in 2005

(Millions of 1992 Dollars)

	SCENARIOS			
State	A-Low	A-High	B-Low	B-High
Illinois	2	18	27	109
Indiana	5	32	41	179
Michigan	6	41	109	424
Minnesota	2	19	28	107
New York	19	137	176	656
Ohio	2	14	21	97
Pennsylvania	3	21	30	111
Wisconsin	4	37	52	197
TOTAL	43	319	484	1,880

Exhibit B-8

Loss in Potential Employment by State in 2005

State	B-Low	B-High	A-Low	A-High
	SCENARIOS			
Illinois	52	371	551	2,187
Indiana	93	698	882	3,719
Michigan	131	843	2,252	8,681
Minnesota	42	312	459	1,750
New York	227	1,660	2,316	8,427
Ohio	50	371	536	2,378
Pennsylvania	48	348	512	1,868
Wisconsin	102	799	1,141	4,220
TOTAL	745	5,402	8,649	33,230

Exhibit B-9

Level of Personal Income in 2005 and Changes Due to GLI Using EPA Cost Study Scenarios

(Millions of 1992 Dollars)

State	Base Case	Scenario #2	Scenario #3
Illinois	254,882	-7	-17
Indiana	106,925	-9	-28
Michigan	175,663	-23	-56
Minnesota	98,007	-4	-15
New York	419,357	-43	-105
Ohio	212,024	-4	-13
Pennsylvania	244,713	-8	-36
Wisconsin	100,115	-13	-22
TOTAL	1,611,686	-111	-292

Exhibit B-10

Level of Employment of 2005 and Changes Due to GLI Using EPA Cost Study Scenarios

State	Base Case	Scenario #2	Scenario #3
Illinois	6,159,121	-173	-411
Indiana	3,019,545	-253	-763
Michigan	4,448,995	-550	-1,374
Minnesota	2,682,545	-89	-294
New York	9,021,678	-597	-1,542
Ohio	5,687,897	-126	-408
Pennsylvania	5,966,943	-166	-766
Wisconsin	2,817,819	-336	-549
TOTAL	39,804,545	-2,288	-6,105

Exhibit B-11

Direct Compliance Costs by State -- Policy Set B

	Direct Compliance Costs		Percentages	
	B-Low	B-High	B-Low	B-High
IL	$0.5	$1.0	0.9%	0.3%
IN	$7.2	$44.3	12.1%	11.6%
MI	$9.2	$58.7	15.5%	15.4%
MN	$0.4	$3.8	0.7%	1.0%
NY	$15.9	$111.3	26.8%	29.2%
OH	$19.0	$114.8	32.0%	30.1%
PA	$0.4	$3.7	0.7%	1.0%
WI	$6.7	$43.2	11.3%	11.3%
Grand Total	$59.4	$380.9	100.0%	100.0%

Exhibit B-12

Breakdown of Direct Compliance Costs by State and Manufacturing Sector:
Scenario A-High

Industry SIC	*IL*	*IN*	*MI*	*MN*	*NY*	*OH*	*PA*	*WI*	*Grand Total*
Metal Mining	0	0	0	0	0	0	0	0	0
Food and Kindred Products	0	11	26	3	32	0	2	33	107
Tobacco Products	0	0	0	0	0	0	0	0	0
Textile Mill Products	0	0	1	0	3	1	0	1	6
Lumber and Wood Products *(except Furniture)*	0	3	4	1	3	4	0	5	20
Paper and Allied Products	0	3	115	1	84	13	1	140	356
Printing, Publishing, and Allied Industries	0	4	11	1	55	12	1	8	93
Chemicals and Allied Products	9	19	87	0	62	42	1	5	226
Petroleum Refining and Related Industries	0	33	4	1	1	92	1	1	133
Rubber and Miscellaneous Plastics Products	0	7	15	0	10	22	1	7	62
Leather and Leather Products	0	0	0	0	1	0	0	1	2
Stone, Clay, Glass, and Concrete Products	0	3	8	1	7	11	1	3	32
Primary Metal Industries	23	96	133	0	103	120	1	5	480
Fabricated Metal Products *(except machinery and transp. equipment)*	0	8	35	1	15	33	1	12	105
Industrial and Commercial Machinery and Computer Equipment	0	12	44	2	34	39	1	32	166
Electronic and Other Electrical Equipment and Components *(except computer equipment)*	0	12	8	1	36	25	1	13	96
Transportation Equipment	0	20	167	1	24	89	1	14	316
Measuring, analyzing, and controlling instruments; photographic, medical and optical goods; watches and clocks	0	3	6	1	46	6	0	6	67
Miscellanous Manufacturing Industries	0	1	2	0	10	3	0	2	19
Grand Total	**32**	**236**	**666**	**14**	**626**	**612**	**14**	**286**	**2,286**

Appendix C. Individuals Contacted: Selected List

CHEMICAL MANUFACTURERS ASSOCATION, Elaine Patterson

FORD, Dearborn, MI, F. Patrick Nixon, Manager, Water Quality Regulation, Environmental Quality Office

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GREAT LAKES WATER QUALITY COALITION, Cleveland, OH Karen J. Neale, Executive Director

INTERNATIONAL PAPER, Madison, WI, Aleesa Bell, Regional Public Affairs Manager

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CITY OF LIMA, OHIO, Alice Gadsey

CITY OF OWOSSO, MICHIGAN, Gary Burk

MICHIGAN DEPARTMENT OF NATURAL RESOURCES, James E. Grant, Chief, Great Lakes Environmental Assessment Section, Surface Water Quality Division

MICHIGAN DEPARTMENT OF NATURAL RESOURCES, G. Tracy Mehan, III, Director, Office of the Great Lakes

MICHIGAN DEPARTMENT OF NATURAL RESOURCES, David Webb

MICHIGAN DEPARTMENT OF NATURAL RESOURCES Rollier Harmes, Director, DNR

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MINNESOTA POLLUTION CONTROL AGENCY, Charles Williams, Commissioner

MINNESOTA POLLUTION CONTROL AGENCY, Marvin Hora

MINNESOTA POLLUTION CONTROL AGENCY, Gary Kimball

MINNESOTA POLLUTION CONTROL AGENCY, Gary Glass

MOBIL OIL CORPORATION, Fairfax, VA, Robert S. Elvert, Legislative & Regulatory Environmental Advisor

NATIONAL ASSOCIATION OF METAL FINISHERS, Bill Sontag

NATIONAL WILDLIFE FEDERATION, Great Lakes Natural Resource Center, Rebecca Schenir, Cameron Davis, Tim Edler

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION, Richard Draper

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION, Allan Tedrow

NORTHEAST OHIO REGIONAL SEWAGE DISTRICT, Keith Lin

OHIO ENVIRONMENTAL PROTECTION AGENCY, Gary Martin, Water Director

OHIO ENVIRONMENTAL PROTECTION AGENCY, Ava Hottman

OHIO ENVIRONMENTAL PROTECTION AGENCY, Seif Amragi

PENNSYLVANIA ENVIRONMENTAL RESOURCES DEPARTMENT, James Rozakis, Asst Dir.

SIERRA CLUB, Ann Roy

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V, Dale Bryson, Water Director

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V, Ken Fenner

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V, Susan Gilbertson

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V, Arnold Leder

WESTERN LAKE SUPERIOR SANITARY DISTRICT, Detroit, MI, Joseph Stepun

WISCONSIN ELECTRIC POWER COMPANY, David Lee

WISCONSIN NATURAL RESOURCES DEPARTMENT, Bruce Baker

WISCONSIN NATURAL RESOURCES DEPARTMENT, Duane Scheuttpelz

WISCONSIN NATURAL RESOURCES DEPARTMENT, David Webb

WISCONSIN NATURAL RESOURCES DEPARTMENT , Lyman F. Wible, Administrator, Division for Environmental Quality

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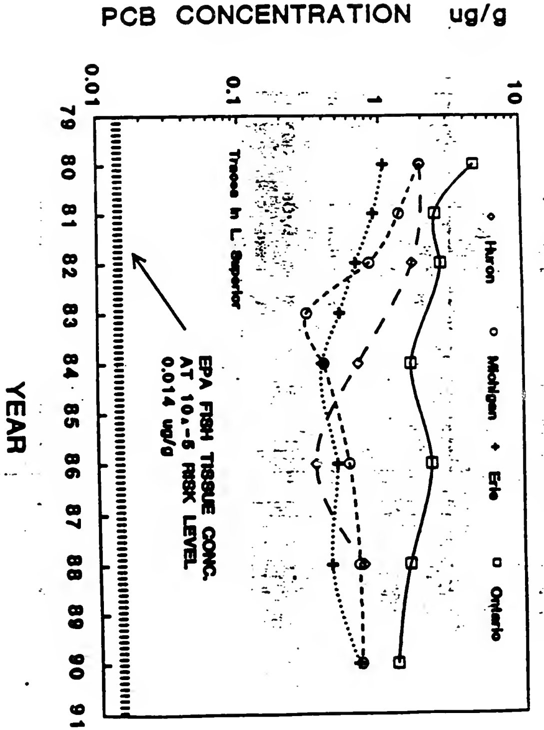
Supplementary Material
Statement of George Coling
Sierra Club
3/24/94

Figure I-2: **PCB concentration in coho salmon (µg/g).**



Source: DeVault et al., 1988; DeVault, 1993b.
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COAST ALLIANCE FACT SHEET

Assessment and Remediation of Contaminated Sediment The ARCS Program - Five Years Testing Technologies

BACKGROUND

Critical efforts to test technologies that isolate or reduce the toxicity of contaminated sediments have been underway since 1987. The Assessment and Remediation of Contaminated Sediments (ARCS) program, a pilot project begun in the Great Lakes by EPA, has tested more than ten technologies for the clean up of contaminated sediment. The ARCS program received $5 million a year for five years for work on five sites. Coordinated through the Great Lakes National Program Office (GLNPO) of the U.S. EPA, the program has focused on the following sites: Saginaw, Michigan; Grand Cal, Indiana; Ashtabula River, Ohio; Buffalo River, New York; and Cheyboygan, Wisconsin.

PROCESS

At the beginning of the program, EPA and the U.S. Army Corps of Engineers did a literature review of all decontamination technologies available. This included technologies developed through Superfund, hazardous waste, mining and sewage sludge programs, as well as different dredging techniques to minimize resuspension and to do area-specific dredging. Projects were expected to be conducted on three different scales: Bench Scale -- a few cubic yards of sediment; Pilot Scale -- a few hundred cubic yards of sediment; and Full Scale -- a few thousand cubic yards of sediment. After five years of testing, GLNPO is finishing a remediation guidance document, currently under EPA headquarters and OMB review, which draws conclusions from the five ARCS site activities. The following is preliminary data as of February 1994 drawn from this guidance document, and final data should be available by summer of 1994.

RESULTS

1. **Saginaw, Michigan**

Process: Sediment washing
Targeted Pollutants: PCBs and metals
Vendor: Bergman USA
Prognosis: This technology works well on sediments that are a mixture of sand co-mingled with fine-grained materials. It only works on a mixture with a large volume of sand. It physically separates fine-grained from coarse-grained materials and effectively reduces the volume of contaminated materials. It converts a large volume of mildly contaminated material to a small volume of highly contaminated material which must then be further processed using another technique.
Cost Estimate: $39-224 per cubic yard.

2. **Grand Cal, Indiana**

Process: BEST Chemical Extraction
Targeted Pollutants: PCBs and PAHs
Prognosis: It seemed to work more efficiently when the volume of mud increased; i.e., it

worked better on a pilot scale than on a bench scale level. It successfully removed more than 98% of the total PCB's and PAHs.
Cost Estimate: $138-357 per cubic yard.

3 & 4 Ashtabula River, Ohio, and Buffalo River, New York
Process: Low Temperature Thermal Desorption
Targeted Pollutants: PAHs, PCBs and hexachlorabenzene
Vendor: ReTec
Prognosis: The Buffalo River was done first and then the Ashtabula. The results were better on Ashtabula muds than on Buffalo muds, but the difference could be due to more sophisticated techniques as the work progressed, or to fundamentally different muds. They got the following removal rates on Ashtabula muds -- 86% PCBs, 99% semi-volatile compounds (PAHs, organics), 92% volatile compounds.
Cost Estimate: $350-535 per cubic yard.

5. Sheboygan, Wisconsin
Process: Bioremediation
Targeted Pollutants: PCBs
Prognosis: Fairly ineffective. The rate of breakdown of PCBs was extremely slow. They tested 2,700 cubic yards of mud which was placed in a large metal box divided into four quadrants. They added biological elements to each quadrant to break down the PCB's. This project was done in conjunction with the Superfund program.
Estimated Cost: No estimate yet.

It is suggested that most ARCS technologies would be applicable to marine sediments. Most of the principles of freshwater sediment decontamination should apply to saltwater decontamination. The ARCS program is now working with the Bureau of Mines to further explore technologies that could be used at low cost on large volumes of contaminated sediments.

LEGISLATION TO CONTINUE AND EXPAND SEDIMENT DECONTAMINATION
Sens. Howard Metzenbaum (D-OH), John Glenn (D-OH), Carl Levin (D-MI), Herbert Kohl (D-WI), Russ Feingold (D-WI), Carol Moseley-Braun (D-IL), Paul Simon (D-IL), and Don Riegle (D-MI) are co-sponsoring S. 1183, legislation that will continue and expand the ARCS Program. It is anticipated that this bill will be part of the Clean Water Act reauthorization bill in the Senate. In the House, Rep. Eric Fingerhut (D-OH) introduced H.R. 2565, which will also continue and expand the ARCS program. It is hoped that this legislation will pass and that the ARCS program will receive additional funding to continue its research into decontamination technologies. As the program moves forward, more emphasis should be placed on full scale demonstrations dealing with both fresh and salt water. It is also hoped that technologies will be tested that deal with the pervasive problem of dioxin contamination. New technologies are constantly being developed and must be tested. It is crucial that the most effective and least costly options become available for use.

FOR MORE INFORMATION
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February 1994

SOCIETY

The Estrogen Complex

Science: Sperm counts down? Penises shriveled? Hey, Rush, don't blame it on feminists. It may be from chemical pollutants in water and food.

ALL LOUIS GUILLETTE WANTED TO do was to help figure out how many alligators could be hunted from Florida's Lake Apopka without making the population crash. But after years of wading (carefully) through the thigh-deep muck and sneaking up (warily) on alligator nests to snare the great reptiles with a noose, it dawned on him that the gators had bigger worries than winding up as pocketbooks. Male alligators' penises were only one quarter the normal size, their testosterone levels were so low they were probably sterile. Soon after, Guillette met a researcher who had seen similar effects on lab mice exposed to a cousin of the chemical DDE, formed when DDT decomposes. Not coincidentally, thousands of gallons of DDT-containing pesticide had spilled into Lake Apopka in 1980. Connecting the dots, Guillette said, "I think we have a problem here." By "we," he didn't mean alligators. Because people live in a sea of the same gender-bending chemicals, the University of Florida researcher recently told a congressional panel, "every man in this room is half the man his grandfather was."

It is a plot twist worthy of science fiction. Hundreds of the bedrock chemicals of the postwar age—PCBs used in the manufacture of electronics, pesticides such as endosulfan and atrazine, polycarbonate plastic found in many baby bottles and water jugs, chlorine compounds that bleach paper—resemble the human sex hormone estrogen. Although the compounds were concocted in the lab for purposes having nothing to do with human biology, their molecular structure turns out to be so similar to estrogen's that they fit into the same "receptors" in the body. (Contrary to popular belief, men as well as women produce estrogen, and so have receptors for the hormone.) The estrogen receptor can no more tell that it's being occupied by an impostor than a door lock can tell that a thief's skeleton key has been inserted. As a result, the estrogen mimics can trick the body into turning off, or ratcheting up, certain biochemical pathways—especially those in the reproductive system. The result: sexual development, in both males and females, gone seriously askew. Since the impostors find their way into the soil, water and food supply, researching their effect on health "is a top priority for us," says Kenneth Olden, director of the National Institute of Environmental Health Sciences. "There's enough science out there to tell us we should be concerned."

For one thing, "half your grandfather" is no hyperbole. Since 1938, sperm counts of men in the United States and 20 other countries have plunged by an average of 50 percent, reported Danish endocrinologist Niels Skakkebaek in 1991. At the same time, testicular cancer has tripled. The trends could be a coincidence. But Skakkebaek suspects that the culprit in both the sparse sperm counts and the cancers may be men's exposure, as fetuses and newborns, to estrogenlike chemicals in their mothers' blood and milk.

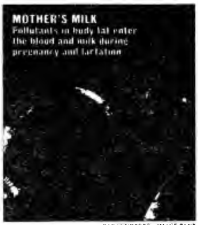
While it's too soon to say that "background" levels of estrogenlike chemicals are responsible for the decline and fall of Western manhood, the case against *high* levels of the chemicals is clear-cut. In Michigan, estrogen mimics called PBBs accidentally got into cattle feed in 1973, and from there into beef. Women who ate the meat, and whose breast milk harbored high levels of PBBs, had sons with testicular malformations and undersized penises. And in the closest thing to a controlled study in such a tricky field, Chinese scientists have been studying 118 boys in Taiwan who were born to women exposed to a PCB spill in 1979. Compared with boys whose mothers were not exposed, the 118 suffered reproductive defects like those of the boys in Michigan. These abnormalities "were probably related to hormonal changes caused by toxic exposure," the scientists conclude.

Now physicians are analyzing studies that link estrogenlike pollutants to breast cancer and endometriosis, the painful inflammation of the uterine lining that often

Gender Bender

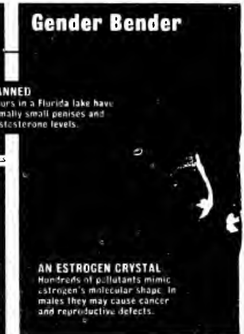
UNMANNED Alligators in a Florida lake have abnormally small penises and low testosterone levels.

JOE McDONALD—ANIMALS ANIMALS



MOTHER'S MILK Pollutants in body fat enter the blood and milk during pregnancy and lactation

DAG SUNDBERG—IMAGE BANK



AN ESTROGEN CRYSTAL Hundreds of pollutants mimic estrogen's molecular shape. In males they may cause cancer and reproductive defects.

[illegible] thing [illegible] there were only 21 reported cases in the world 70 years ago; today there are 5 million in the United States alone. In a new German study, women with endometriosis were more likely than others to have high levels of PCBs in their blood. Some breast cancer may also have an environmental cause. Unusual amounts of DDE, the pesticide residue that seems to be leaving the alligators shortchanged, shows up in the tissue of women with breast cancer, according to a study last year by Mary Wolff of New York's Mount Sinai School of Medicine. Women with the greatest number of these DDE footprints were four times more likely to get breast cancer than women with the fewest such signs. The connection is plausible. This year the National Cancer Institute will begin a major study of the high rates of

DAVID M. PHILLIPS – PHOTO RESEARCHERS

SHOOTING BLANKS
Men's sperm counts are down 50 percent since 1938, says one study.

CROP DUSTER
Among the chemicals that mimic estrogen are widely used pesticides.

AL LAMME – PHOTOTAKE

ROBERTO VALLADARES – IMAGE BANK

breast cancer on New York's Long Island, assessing women's exposure to estrogenlike compounds in pesticides once used on the potato fields (and still in the aquifers) where suburbs now sprout.

Playing canary in the coal mine, wildlife "was the first to send signals that something was seriously wrong," says zoologist Theo Colborn of the World Wildlife Fund. Fish in places like the Great Lakes, where PCB and DDT concentrations are extremely high, and the terns and gulls that eat them, are becoming biochemical hermaphrodites: the males have reproductive parts of both sexes. Florida panthers, eating high on a food chain contaminated with estrogenlike pesticides, have their own reproductive problems: more infertile females, sterile males, lower sperm counts and high estrogen levels. One male, says toxicologist Charles Facemire of the U.S. Fish and Wildlife Service, "had estrogen levels higher than most females."

Despite such findings, "much of the evidence [about estrogen mimics] is circumstantial," says Thomas Goldsworthy of the Chemical Industry Institute of Toxicology. Although there is no question that the pollutants fit the body's estrogen receptors, there's still some wiggle room to argue that the chemicals do not switch on the same biological pathways that real estrogen does. Skeptics also ask why, if the ubiquitous estrogen impostors really trigger cancers and other diseases, rates of the illnesses are not higher. Lawmakers may not wait for an answer. In February, the Clinton administration called for an 18-month study of chlorine (a component in many estrogenlike chemicals) to assess its effects on human health and the environment, with an eye toward restricting or banning it. A bill in Congress would phase out chlorine in the paper and pulp industries over five years. Hell has no fury like a congressman who discovers he's not the man he thought he was.

SHARON BEGLEY *with* DANIEL GLICK

And Now the Good News

NOT ALL ESTROGENS, OR ESTROgen impostors, twist sexual development and increase the risk of cancer. Just as there is good cholesterol and bad cholesterol, there is good estrogen and bad estrogen, forms of the hormone that differ by only a few molecules. As Devra Lee Davis, a senior scientist at the Department of Health and Human Services, puts it, "All estrogen is not equal." Her theory is that when the body manufactures estrogen, the hormone can be broken down by either of two biochemical pathways. One leads to a form called 16-hydroxyestrone, which can damage DNA and so is the form suspected of spurring breast and testicular cancers. The other leads to a form called 2-hydroxyestrone that does no harm, and may even do good.

Many edible plant products, such as French beans, soybeans and pomegranates, contain "phytoestrogens" that might combat cancer, suggests Kenneth Setchell of the Children's Hospital Medical Center in Washington. In his lab, rodents that are fed soy protein develop fewer tumors than those on a soy-free diet. This might help explain why women in Japan have low rates of breast cancer when they eat tofu, soy sauce and miso—all rich sources of good estrogen—but have "American" rates when they move to the United States and adopt a Western diet. Compounds in such "healthy" foods as broccoli, says Davis, might nudge estrogen down the path to the cancer-fighting form.

Last fall Victor Henderson of the University of Southern California reported a tantalizing link between estrogen and a lower risk of Alzheimer's disease: in a group of 2,418 postmenopausal women, those who took estrogen pills (for such problems as osteoporosis and hot flashes) were 40 percent less likely to develop this crippling dementia than those who did not take estrogen. In rats, estrogen helps make a "growth factor" that maintains and strengthens connections between neurons. It also helps produce an enzyme that speeds communications among neurons. The effect seems to be particularly strong in memory centers, the first to be ravaged by Alzheimer's.

Developmental Effects of Endocrine-Disrupting Chemicals in Wildlife and Humans

Theo Colborn,[1] Frederick S. vom Saal,[2] and Ana M. Soto[3]

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Large numbers and large quantities of endocrine-disrupting chemicals have been released into the environment since World War II. Many of these chemicals can disturb development of the endocrine system and of the organs that respond to endocrine signals in organisms indirectly exposed during prenatal and/or early postnatal life; effects of exposure during development are permanent and irreversible. The risk to the developing organism can also stem from direct exposure of the offspring after birth or hatching. In addition, transgenerational exposure can result from the exposure of the mother to a chemical at any time throughout her life before producing offspring due to persistence of endocrine-disrupting chemicals in body fat, which is mobilized during egg laying or pregnancy and lactation. Mechanisms underlying the disruption of the development of vital systems, such as the endocrine, reproductive, and immune systems, are discussed with reference to wildlife, laboratory animals, and humans. *Key words:* developmental effects, diethylstilbestrol, differentiation, endocrine function, estrogen, fertility, hormones, organochlorines, pesticides, phenolics, reproductive function. *Environ Health Perspect* 101: 378–384(1993)

Convincing evidence exists that a variety of pollutants, some of which can disrupt endocrine development in wildlife and laboratory animals, is found in rain water, well water, lakes, and oceans, as well as freshwater, marine, and terrestrial food products. This paper identifies the need for a greater awareness about the long-term health consequences associated with exposure to endocrine-disrupting chemicals during early life. Endocrine-disrupting effects are not currently considered in assessing risks to humans, domestic animals, and wildlife. Taking into consideration what is currently known about chemicals that disrupt the endocrine system, the effects 1) may be manifested in an entirely different way, and with permanent consequences, in the early embryo, fetus, and neonate from effects as a result of exposure only in adulthood; 2) can change the course of development and potential of offspring, with the outcome depending on the specific developmental period(s) of exposure; and 3) are often delayed and thus may not be fully or obviously expressed until the offspring reaches maturity or even middle age, even though critical exposure occurred during early embryonic, fetal, or neonatal life.

In mammals as well as all other vertebrates, communication among cells is required for development to progress normally. Substances produced by one group of cells can direct the course of development and thus determine the future functioning of another group of cells (*1*). For example, a group of compounds, the steroid hormones produced by the mother's ovaries and adrenal glands, the placenta, and the fetal gonads and adrenal glands, has been identified as playing a major role in regulating developmental processes in many tissues (*2*). Organogenesis, a particularly vulnerable stage of development, begins in humans at the end of the second month of gestation. At this time the course of development of many tissues is regulated by endogenous steroid hormones along with other endocrine and paracrine factors (*3*).

It is now recognized that numerous endocrine-disrupting chemicals have been released into the environment in large quantities since World War II (Table 1). Some of these chemicals bind to intracellular receptor proteins for steroid hormones (*4*) and evoke hormonal effects in animals (*5*), humans (*6*), and cell culture (*7,8*). They thus interfere with the functioning of receptors whose normal role is to mediate the effects of the endogenous steroid hormones (*9*). Laboratory experiments have demonstrated that exposure of fetuses to endocrine-disrupting chemicals can profoundly disturb organ differentiation (*10,11*) because they can act as hormone agonists or antagonists. Organs that appear to be at particular risk for developmental abnormalities in offspring because of maternal exposure are those with receptors for gonadal hormones: in female fetuses this includes the mammary glands, fallopian tubes, uterus, cervix, and vagina, and in male fetuses it includes the prostate, seminal vesicles, epididymides, and testes. In both sexes the external genitalia, brain, skeleton, thyroid, liver, kidney, and immune system are also targets for steroid hormone action and are thus potential targets for endocrine-disrupting chemicals, although these chemicals may have multiple modes of action, in addition to acting as hormone agonists and antagonists, in different target tissues (*11–15*).

A major concern is the profound and permanent effects that exposure to endocrine disruptors during critical periods in development can have on the future well-being of wildlife and humans, although chronic exposure after maturity can also present a health risk. It is generally assumed that after maturity, exposure to endocrine disruptors does not permanently alter the functioning of hormone-responsive tissues. However, experimental studies in animals have shown permanent changes in brain (*16*) and vaginal epithelium (*17*) in females and prostate in males (*18*) after administration of estrogenic chemicals in adulthood. The possibility thus exists that chronic, low-level exposure to estrogenic chemicals in the environment after maturity can have effects in humans similar to those observed in laboratory animals administered estrogen (*19*).

Wildlife

Exposure to endocrine-disrupting chemicals in the environment has been associated with abnormal thyroid function in birds (*20*) and fish (*21*); decreased fertility in birds (*22*), fish (*23*), shellfish (*24*), and mammals (*25*); decreased hatching success in fish (*26*), birds (*27*), and turtles (*28*); demasculinization and feminization of male fish (*29*), birds (*30*), and mammals (*31*); defeminization and masculinization of female fish (*32*), gastropods (*33*), and birds (*30*); and alteration of immune function in birds (*34*) and mammals (*35*). These deleterious health effects have been observed in many areas where the presence of multiple man-made chemicals, such as byproducts of industrial chemical synthesis (chemical waste) and pesticides (*36*), has been established. The effects were not reported before the 1950s and are currently observed in many areas, such as the Great Lakes in North America. Although much of the data presented here is from studies conducted in and around the Great Lakes, it is important to note that the level of contamination in the Great Lakes region is no greater than some of the other major drainage basins in the United States (*37*).

Researchers from Guelph University report a 100% prevalence of thyroid enlargement in 2–4-year-old salmon in the Great Lakes. Moreover, in some Great Lakes salmon stocks, there is an extremely high prevalence of precocious sexual maturation in males (40–80% depending on the year), poor egg survival (<15%), and low egg thyroid hormone content (*23*). Multiple abnormalities, including behavioral

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changes, reproductive loss, and early mortality in offspring have been documented in bird species that feed on Great Lakes fish (*38*). Reproductive loss and early mortality have also been observed in offspring of confined mink that were fed Great Lakes fish (*39*).

The devastating effect of DDT on embryonic survival in bald eagles due to eggshell thinning and cracking has been known for some time (*40*). DDT was introduced on a large scale into the environment in the early 1940s. Restrictions on the use of DDT since 1972 have been only partially successful in reducing levels in the Great Lakes (*36*). Monitoring nesting sites along the Great Lakes shoreline indicates that while eggshell thinning has abated, embryonic and chick survival is not adequate to maintain stable populations. Recruitment is from inland populations that responded to the restrictions on DDT and other chemicals and that do not depend on contaminated fish in the Great Lakes as a primary food source. However, adult bald eagles that migrate to the shoreline have difficulty producing viable offspring after consuming fish and other food from the Great Lakes for 2 or more years (*36*). The shoreline has thus become a "black hole" for bald eagles that migrate from successful inland populations. Abandoned eggs hold as much as 10 times the critical concentration of DDT below which stable populations of bald eagles can be maintained (*41*). In addition to DDT, bald eagles carry elevated concentrations of other compounds that are known endocrine disruptors, such as chlordane, dieldrin, and polychlorinated biphenyls (PCBs) (*41*). Similar findings have been reported for bald eagles nesting along the Columbia River in Washington State (*42*).

There are several explanations for the continued elevated concentrations of endocrine-disrupting chemicals in wildlife tissues and the associated instability in wildlife populations, despite the fact that some of the chemicals have been regulated. First, many pesticides, such as DDT, are still manufactured abroad and used extensively in developing countries where there are limited safeguards or monitoring of use. There is now evidence that DDT, PCBs, and other chemicals that readily vaporize are being transported long distances over the globe via the atmosphere (*43,44*). For example, it is estimated that 90% of the PCBs entering Lake Superior, the largest of the Great Lakes, is derived from the atmosphere (*36*). Second, some chemicals are very persistent: DDT has a half-life of 57.5 years in temperate soils (*45*). PCBs were introduced in 1929, and production ceased in the United States in 1972. Many PCB residues which are endocrine disrupting and/or developmental toxicants have not been properly stored and are already dispersed in the environment. PCBs will be around over geologic time (*46*).

Table 1 Chemicals with widespread distribution in the environment reported to have reproductive and endocrine-disrupting effects

Chemical	Reference
Pesticides	
Herbicides	
2,4-D	*(98,99)*
2,4,5-T	*(100)*
Alachlor	*(99,101)*
Amitrole	*(102,103)*
Atrazine	*(104–106)*
Metribuzin	*(107)*
Nitrofen	*(10)*
Trifluralin	*(108,109)*
Fungicides	
Benomyl	*(110)*
Hexachlorobenzene	*(111–114)*
Mencozeb	*(108)*
Maneb	*(115,116)*
Metiram-complex	*(117)*
Tributyl tin	*(118,119)*
Zineb	*(116)*
Zirem	*(99)*
Insecticides	
β-HCH	*(120)*
Carbaryl	*(100)*
Chlordane	*(121)*
Dicofol	*(30)*
Dieldrin	*(113)*
DDT and metabolites	*(30)*
Endosulfan	*(122; A. Soto, unpublished)*
Heptac[illegible] and H-epoxide	*(113)*
Lindan[illegible]CH)	*(123)*
Methomy[illegible]	*(107)*
Methoxychlor	*(5,124)*
Mirex	*(A. Soto, unpublished)*
Oxychlordane	*(121)*
Parathion	*(125)*
Synthetic pyrethroids	*(126)*
Toxaphene	*(A. Soto, unpublished)*
Transnonachlor	*(121)*
Nematocides	
Aldicarb	*(107)*
DBCP	*(10,99)*
Industrial chemicals	
Cadmium	*(127)*
Dioxin (2,3,7,8-TCDD)	*(85–87)*
Lead	*(128,129)*
Mercury	*(130)*
PBBs	*(131)*
PCBs	*(72,132,133)*
Pentachlorophenol (PCP)	*(134)*
Penta- to nonylphenols	*(8)*
Phthalates	*(135–140)*
Styrenes	*(8,141,142)*

Effects of pollutants on the reproductive system, in addition to the well-documented reduction in eggshell thickness, became apparent in the late 1970s when histopathological examination of herring-gull embryos and newly hatched chicks collected in Lake Ontario revealed oviducts and gonads resembling ovaries in male birds and abnormal development of the oviductal system in female birds (*38*). Follow-up laboratory studies using DDT and other pesticides which remain in wide use today (dicofol, kelthane, and methoxychlor) produced the same results in kestrels, western gulls, and California gulls (*30,47*). Today, adult female herring gulls have been observed tending double clutches in their nests in unstable populations (*38*). Elevated concentrations of DDT, its metabolite, DDE, PCBs, and other organochlorine residues have been found in eggs from these populations (*48*). It has not been determined whether half of the birds that are pairing are genotypic males that had been feminized during embryonic development by environmental chemicals with estrogenic activity or whether they were all genotypic females showing abnormal behavior. Recent laboratory experiments with small mammals corroborate many of the anomalies cited above, although the effects vary among species and among chemicals (*5*).

The DES Syndrome: A Model for Exposure to Estrogenic Chemicals in the Environment

Diethylstilbestrol (DES) is a synthetic estrogen that was used by physicians to prevent spontaneous abortions in women from 1948 until 1971, when its use for this purpose was banned. DES-exposed humans thus serve as a model for exposure during early life to any estrogenic chemical, including pollutants in the environment that are estrogen agonists. The primary model for determining estrogenic activity of a chemical is the stimulation of mitotic activity in the tissues of the female genital tract in early ontogeny, during puberty, and in the adult (*49*), although estrogen also affects other tissues in females and males (*2,19*). Daughters whose mothers took DES (about 1 million or more between 1960 and 1970) suffer reproductive organ dysfunction, abnormal pregnancies, a reduction in fertility, immune system disorders, and periods of depression (*50,51*). As young adults these women also suffer increased rates of vaginal clear-cell adenocarcinomas (*52*); this is a reproductive tract cancer found in women beginning in their fifties, but it is rare in women in their twenties (*50,51*). A major concern is that when women exposed *in utero* to estrogenic chemicals (DES and/or environmental pollutants that are estrogen agonists) reach the age at which the incidence of reproductive organ cancers normally increases, they will show a much higher incidence of cancer than unexposed individuals.

There is a substantial literature documenting the detrimental effects of exposure to DES during the critical period of organ differentiation in experimental studies using rodents. Animal models corroborate clinical studies in humans. For example, dysplastic changes in the rodent prostate (*53*) are comparable to those seen in stillborn male offspring of women treated with DES (*54*). In female mice, DES exposure during early life leads to permanent cornification of the vaginal epithelium, which may be independent of effects on the brain–pituitary–ovarian axis (*50,55,56*). Significant impairment of immune function (particularly the T-cell system) has also been reported after exposure to DES during early life (*57*) as well as an increase in autoimmune diseases in women (*58*). These outcomes were typically not noticeable at birth and often not detected before maturity. For example, treatment of male rats with DES during the first month after birth [accessory reproductive organs are still developing (*2*)] did not result in observable malignancies at 6–9 months of age, but by 20 months (old age), squamous cell cancer was detected with involvement of the dorsolateral prostate (*59*). In female mice treated during early life with DES, an increase in sensitivity of mammary glands to carcinogens has been reported (*60*).

A variety of agricultural and industrial chemicals produced today (either within or outside the United States) are capable of binding to intracellular estrogen receptors either directly, such as *o,p'*-DDT (*61*), or after *in situ* conversion to an active metabolite. For example, the pesticide methoxychlor (*62*) is demethylated *in situ* to a more estrogenic bisphenolic compound (*63*). Pesticides such as *o,p'*-DDT, chlordecone (*6*), and components of plastics, such as nonylphenol (*7*), mimic the action of endogenous estrogens (and exogenous DES) both in laboratory animal models as well as in estrogen-sensitive cells in culture (*8*). A number of conditions in wildlife (reviewed earlier) parallel those reported in laboratory animals and humans exposed to DES during development.

It is worth noting that the estrogenicity of chlordecone was first detected in people working at a pesticide-producing plant (*64*), and although many effects of estrogenic chemicals may be primarily due to exposure during *in utero* development, chronic exposure throughout adulthood is also a concern. For example, in studies with male dogs, which show prostatic hyperplasia during aging, the disease only developed in castrated males treated with both androgen and estrogen, not androgen alone (*18*). Exposure of adult men to estrogen has been implicated in the etiology of prostate hyperplasia (*19,65*). Both prostate cancer and benign prostatic hyperplasia in men and cancers of estrogen-responsive tissues in women (vaginal, cervical, endometrial, and breast) represent major medical problems faced by older people.

It is now suspected that increases in the incidence of numerous pathologies in men and women may be related to exposure to pesticides and other endocrine-disrupting chemicals that can mimic DES and are thus estrogen agonists. The clinical and experimental findings with DES show that consideration must be given to the following facts: 1) an increase in breast and prostatic cancer in the United States occurred between 1969 and 1986 (*66*), 2) a 400% increase in ectopic pregnancies occurred in the United States between 1970 and 1987 (*67*), 3) a doubling of the incidence of cryptorchidism occurred in the United Kingdom between 1970 and 1987 (*68,69*), and 4) an approximate 50% decrease in sperm count worldwide over the last 50 years (*70*). These trends may be a reflection of the increase from estrogenic pollutants in the environment. It has been suggested that the decrease in sperm count in men is the result of exposure during the fetal period of testicular differentiation to pollutants that have estrogenic activity (*71*). For example, an association between reduced sperm motility and PCBs in men with fertility problems has been reported (*72*); some PCBs are directly estrogenic while others become estrogenic after *in vivo* conversion, although the binding affinity of estrogen receptors for estrogenic PCBs is lower than that for estradiol-17ß (*4*).

Characterization of Endocrine-Disrupting Chemicals

Literally thousands of synthetic compounds, a number of which are endocrine disruptors, have been released in the environment, generating concern about their additive and synergistic effects. Also, many of the endocrine disruptors are persistent, lipophilic, and have low vapor pressures, which facilitates their widespread dispersal.

It is common to find PCBs, dioxins, DDT, and a number of other organochlorine pesticides together in human breast milk and adipose tissue (*73,74*). Of concern for humans, domestic animals, and wildlife are the likely additive effects due to exposure to these and other endocrine-disrupting chemicals either together or at different times in life. For example, possible exposure to multiple estrogenic chemicals may be related to the fact that not all offspring of DES-exposed mothers show abnormalities. Although genetic factors may partially account for this outcome, it is also possible that the most affected individuals are those whose mothers were exposed to endocrine-disrupting environmental pollutants with estrogenic activity before or during treatment with DES. Many of the effects of endocrine disruptors that have been reported in wildlife are associated with the presence of a toxic contaminant in the mother due to exposure before egg production in birds and fish or pregnancy and lactation in mammals.

Evidence already exists that a number of organochlorine chemicals (such as dioxin, PCBs, and DDT) has reached concentrations in aquatic food sources that can lead to substantial functional deficits in animals that consume this food. Male rats fed Lake Ontario fish showed hyperreactivity to stress, and offspring of females fed Lake Ontario fish during pregnancy also expressed the same hyperreactive condition, although the offspring were never fed fish (*75*). In addition, offspring of women who ate two to three Lake Michigan fish a month for at least 6 years preceding their pregnancies were slightly preterm, had lower birth weight, smaller skull circumference, and cognitive, motor (hypotonicity and hyporeflexivity), and behavioral deficits at birth compared with offspring whose mothers did not eat fish (*76*). The effects were associated with the mothers' lifetime experience of eating fish, not just what they ate during pregnancy. These findings emphasize the importance of exposure of females to contaminants before pregnancy in terms of effects on their offspring.

Subsequent studies of the above cohort beginning at 6–7 months revealed delays in psychomotor development and poorer visual recognition compared with controls (*77*). When examined at 4 years of age, the children of women who had eaten fish in this study exhibited short-term memory problems, and 17 of the children became intractable and refused to cooperate during testing; they were the children of the mothers with the highest PCB concentrations (measured in their breast milk) in the study (*78*). The childrens' intractable behavior appears to be analogous to the behavior of the rats fed Lake Ontario fish. In another study using the infants of mothers who ate Lake Michigan fish and infants of mothers exposed to a PCB "farm incident," both cohorts experienced growth retardation and neurological effects which were related in a dose-dependent manner to umbilical cord serum PCB concentrations (reflecting the levels in fetal blood) (*79*). It remains to be determined whether the neurotoxic effects mentioned above are mediated through the endocrine system. It is recognized that endocrine-disrupting chemicals may act via multiple mechanisms, some of which may only operate during specific developmental periods (*11,80,81*).

Based on current breast milk concentrations nationwide, it is estimated that at least 5% and possibly more of the babies born in the United States are exposed to quantities of PCBs sufficient to cause neurological effects (*82*). These findings provide evidence that contemporary PCB exposure is above "any regulatory guideline" (*82*: 247). The possible immunological and endocrinological consequences remain to be determined in these cohorts. A major concern is that some of these consequences may not become apparent until young adulthood or even middle age.

Accumulation of pollutants increases the probability of repeated or constant exposure but, as the literature on dioxin shows, administration at only one time in development, rather than the more likely chronic exposure, can profoundly affect the embryo, fetus, or perinatal infant. Ample evidence exists from both *in vivo* and *in vitro* studies that dioxin can antagonize the action of estrogen in some estrogen target cells (*83,84*), although this effect does not appear to be due to dioxin binding to estrogen receptors (*11*). The fact that dioxin is antiestrogenic is important because the conversion of androgen to estrogen in some target cells plays a critical role in masculinization (*2*). For example, a series of studies describing the dose-related inhibition (dose range: 0.064–1.0 µg/kg/ body weight to the dam) of masculinization and persistence of feminine traits in male rat offspring whose dams were fed one meal of dioxin during pregnancy at a critical period during sexual differentiation illustrates the vulnerability of the male rat fetus *in utero* to administration of only one low dose of dioxin to the dam. In these studies the effects were not fully manifested until the rats reached adulthood (*85–87*). These effects would be expected from either chronic, low-dose exposure to dioxin before pregnancy or to a single exposure during a critical time in pregnancy.

Dioxin accumulates in human tissue and is generally found in all tissues of people living in developed countries (*88*). However, only the toxic congeners of the dioxin family complex bioaccumulate in human breast milk (*88*). Similarly, these chemicals have also been found in follicular fluid obtained during *in vitro* fertilization procedures in women (*89*). Although direct correlations have not yet been reported between reproductive success and the presence of xenobiotics in the follicle, these substances could disrupt oocyte development (*19,90,91*).

Many endocrine-disrupting chemicals have been reported in the reproductive tissues of men and women (*74*). These lipid-soluble compounds appear to sequester in all fatty tissue in the body, so that organs and tissues with higher fat content hold more of the compounds on a wet weight basis (*73*). Little is known about the concentrations in embryos and fetuses other than they appear to be similar to those in mothers (*73,92*). Of considerable concern is bioaccumulation of organochlorine chemicals in breast milk due to its high lipid content, which leads to a much higher concentration in breast milk than in maternal blood (*73*). It is well documented that the infant is exposed to higher concentrations of many of these chemicals during breastfeeding than at any other time in its life (*74*).

Consideration should also be given to the fact that man-made chemicals, such as DES, which bind to estrogen receptors in cells, do not bind to estrogen-binding plasma proteins (*93*). One function of estrogen-binding plasma proteins, such as sex-steroid binding globulin in humans, is to restrict entry of endogenous estrogen into cells (*94*). As a result of this affinity, only a small fraction of the total endogenous estrogen in blood is able to pass into cells. This is particularly important during pregnancy when the concentration of estrogen-binding plasma proteins increases dramatically (*2,95*). It is possible that estrogenlike chemicals may show low or no binding affinity to estrogen-binding plasma proteins. These chemicals may be able to freely enter cells (similar to DES), which would greatly increase their biological activity relative to similar blood concentrations of endogenous estrogen, most of which is inhibited from entering cells. This would contribute to the *in vivo* effectiveness of these pollutants, many of which show lower binding affinity to estrogen receptors than the most potent endogenous estrogen, estradiol-17ß (*4*). Environmental pollutants with estrogenic activity are less potent agonists for the induction of proliferation of breast cancer cells *in vitro* (*8*).

Summary

The deleterious effects of endocrine-disrupting chemicals in the environment on the reproductive success of wildlife populations have been documented; this is not an isolated problem, and today many wildlife populations are at risk. At present, no coherent policy has been articulated to remedy this problem. This is due in part to the lack of knowledge concerning which of the many chemicals present in the environment are responsible for endocrine-disrupting effects. Regulatory agencies should recognize that the current endpoints of most tests to assess the risk of pesticides and other pollutants (carcinogenicity, acute toxicity, and immediate mutagenicity) have led to the misconception that these chemicals do not pose a threat to the health of wildlife, domestic animals, or humans. Although the effects of mutagens can be seen immediately in terms of gross abnormalities, the consequences of fetal exposure to endocrine-disrupting chemicals would likely not be recognized until young adulthood, at which time abnormalities, particularly relating to the function of the reproductive system, become apparent.

Because endocrine-disrupting chemicals are in most cases neither mutagens nor acute toxicants at ambient concentrations, they may be released without proper caution into the environment. This may be partially remedied by screening for hormone agonistic and antagonistic activity using hormone-responsive cells in culture; this procedure identifies compounds that are endocrine disruptors because they are hormonally active (*8*). Although this procedure cannot rule out chemicals devoid of hormonal activity that may disrupt development through other mechanisms, it can at least rule out compounds like DDT, chlordecone, alkylphenols, and some PCBs, which are estrogen agonists. It is also essential to continue to examine transgenerational effects in animal studies because some pollutants require metabolism *in vivo* to exert hormonal effects and because neurobehavioral and other developmental effects cannot be addressed with *in vitro* models (*96,97*).

Wildlife species have provided the model for maternal transfer of environmental endocrine-disrupting chemicals with their resulting suite of effects in offspring; experiments with laboratory animals have confirmed the findings. In humans, the DES model is clear and traceable. However, for clinicians and public health authorities, the implications of these findings regarding man-made endocrine disruptors present in air, water, and food for human health is just coming to light. Transgenerational exposure, hormonal activity, functionality, and delayed expression of effects must be addressed when determining the hazards of exposure to persistent chemicals already in the environment and of new chemicals that might be released in the future.

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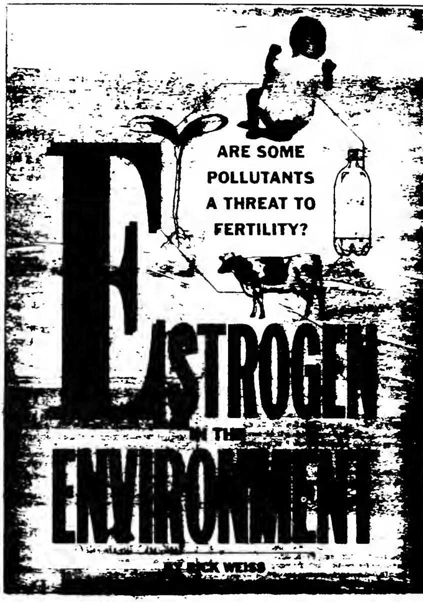
The Washington Post
TUESDAY, JANUARY 25, 1994
HEALTH
ARE SOME POLLUTANTS A THREAT TO FERTILITY?
ESTROGEN
IN THE
ENVIRONMENT
■ Rise in Strep Infections That Can't Be Treated With Standard Drugs



In Florida, a wildlife biologist wonders why alligator eggs are failing to hatch, and why so many male alligators have abnormally small phalluses.

In Denmark, an endocrinologist finds that sperm counts in men have fallen drastically worldwide during the past five decades while the number of testicular cancers has tripled.

In Boston, a cell biologist can't figure out why her experiments with breast cancer cells have suddenly stopped working.

These disparate observations may seem unrelated, but a growing number of researchers suspect they are part of an emerging global problem. Scientists know that certain industrial compounds, pesticides and plastics that mimic the female hormone estrogen are making their way into food and water supplies. The concern is that these estrogen-like pollutants may be wreaking havoc with human and animal reproductive systems.

Health officials are quick to caution that no research has proved a direct cause-and-effect link between reproductive problems in people and these estrogen-mimicking chemicals—many of which are now ubiquitous in the environment.

But a constellation of laboratory experiments, wildlife surveys and human studies offers circumstantial evidence that environmental estrogens pose a hazard, and several federal agencies are taking the issue seriously.

"What we know is that there are many chemicals, including some in the environment, that can work like female sex hormones," said John A. McLachlan, chief of the laboratory of reproductive and developmental toxicology at the National Institute of Environmental Health Sciences (NIEHS). "Some are weak estrogens, and others are strong."

Earlier this month, the NIEHS, a branch of the National Institutes of Health, sponsored a major conference on environmental estrogens that drew representatives from the Food and Drug Administration, the Environmental Protection Agency and the Fish and Wildlife Service, along with 300 cancer researchers, wildlife biologists and physicians from around the world.

"This is potentially a very serious and important problem," said Pentti Siiteri, a University of California-San Francisco endocrinologist and a pioneer in the field of estrogen chemistry who attended the conference. "Scientifically, the potential for harm from these [environmental] estrogens is still really not known. But the potential is so huge for all kinds of reproductive problems that, by God, we have to get after this problem."

Federal officials said that if the evidence becomes convincing that environmental estrogens do pose a health hazard, then agencies such as the EPA will have to develop new regulations to minimize people's exposure to the offending compounds.

But fingering the culprits will be difficult because the chemical family of estrogens is so diverse. Some variants are so potent that minuscule doses have more of an effect than much bigger doses of weaker estrogens. Estrogens also have different effects on fetuses than on adults. In addition, scientists said, there may be "good" estrogens and "bad" estrogens in the environment, with good estrogens actually protecting against cancer.

Estrogens as Pollutants

Scientists have known for decades that the sex hormone estrogen helps stimulate the development of male and female sexual organs in the fetus and later orchestrates the reproductive cycle in women. They've also known that some drugs and even some industrial chemicals can mimic estrogen's effects on the body, and that high doses of these compounds can have profound consequences on health.

The classic example is diethylstilbestrol, or DES. The estrogen-like drug was administered to millions of pregnant women between 1948 and 1971 to prevent spontaneous abortions. But it perturbed the delicate hormonal balance in the womb and ended up causing genital defects in many of the women's children, including vaginal deformities in girls and undescended testicles and abnormally small penises in boys.

In the past decade, scientists have found that the number of environmental contaminants with estrogen-like properties is much greater than they had imagined. The list includes:

- DDE, a contaminant in dicofol, an insecticide sprayed on food crops in this country. (DDE is also the major breakdown product of DDT, the insecticide that was banned in this country in 1972 but is still in wide use around the world);
- So-called nonylphenols and related compounds found in spermicides, hair-coloring products and other toiletries;
- Polychlorinated biphenyls (PCBs), a family of chlorine-containing industrial compounds, no longer made in this country but still in use, that have become widespread contaminants of food and water and are commonly found in human fat tissue and breast milk;
- Endosulfan, a pesticide used on U.S. vegetables;
- Bis-phenol-A, a breakdown product of polycarbonate plastic, from which many plastic water jugs and baby bottles are made.

These and related compounds can elbow their way into cells of the reproductive tracts in fetuses and adults. They attach themselves to molecular receptors, a kind of docking site on cells, that are normally reserved for estrogen. Certain compounds, once they've made themselves at home in these receptors, do more than estrogen could ever do; they act like "super estrogens." In some animals, they can biochemically "feminize" developing embryos so that females end up with overdeveloped sex organs and male fetuses become hermaphrodites or even females. Other compounds seem to do very little while sitting in the estrogen receptor, but preclude the real McCoy from doing its job. Blocking the "real" estrogen from getting into cells has been shown to stymie sexual development in animals.

"In the past, we regulated these chemicals on the basis of whether they killed you or caused cancer," said Theo Colborn, a World Wildlife Fund senior scientist. "Now we need to go back and look at their effects on the embryo's reproductive system."

Human Clues

Some scientists think they're already seeing such effects in humans. Danish endocrinologist Niels E. Skakkebaek suspects that environmental estrogens can explain the curious finding he made in 1992, when he did a 21-country study of semen quality in men. By analyzing records collected over a 50-year period, he and his colleagues documented a 50 percent drop in sperm counts worldwide between 1938 and 1991.

Endocrinologist Louis J. Guillette Jr. straddles an alligator during night field work. His studies suggest that estrogen-like pesticides can change male alligators into females before birth

At the same time, he and others have found, the incidence of testicular cancer and other congenital malformations of the testes and penis have climbed steadily. In the United States, testicular cancer has increased about 50 percent in the past 20 years alone, according to the American Cancer Society.

In a scientific paper published last year, Skakkebaek and Richard M. Sharpe of the Center for Reproductive Biology in Edinburgh proposed that both trends are the result of maternal exposure to environmental estrogens during pregnancy. The contaminants, they suggest, affect the early development of sex organs in male fetuses.

The hypothesis, though not proved, is plausible, said several researchers at the conference. A number of epidemiological studies have shown a link between exposure to estrogen pollutants and higher rates of reproductive problems. In one study, scientists looked at mothers in Michigan who had higher than average levels of polybrominated biphenyls (PBBs) in their breast milk. (PBBs, a class of industrial flame retardant, are close chemical cousins of PCBs; they got into the food supply in Michigan when a batch was mistakenly dumped into a supply of animal feed that was consumed by cattle destined for grocery stores.) The researchers found that these women's sons had more testicular abnormalities and smaller penises than boys of mothers with below average residues of PBBs in their breast milk.

And a study of Taiwanese boys born to mothers exposed to dioxin, another environmental estrogen, showed that these boys also have abnormally small penises—an effect previously documented in laboratory rats.

Men are not the only ones whose reproductive systems may suffer from exposure to estrogen mimics. Researchers are also concerned that these compounds may play a role in the problem of endometriosis, a painful overgrowth of uterine tissue that affects an estimated 5 million women in the United States and can cause fertility problems.

Animal research provides some support for this view. A recent study in monkeys, for example, suggests that the estrogen-like chemical dioxin can cause endometriosis. Sherry E. Rier of the University of South Florida College of Medicine and her colleagues reported last year that rhesus monkeys exposed to high doses of dioxin had significantly higher rates of endometriosis than unexposed monkeys. The odds of having the syndrome were proportional to the dioxin doses they received. But scientists said they don't know how to compare the short-term high-dose exposures in monkeys to the long-term low-dose exposures typically seen in people.

In another development, German researchers recently found that women with endometriosis were more likely than their healthy counterparts to have elevated levels of PCBs in their blood. Now both the EPA and NIH are sponsoring studies aimed at clarifying the links between endometriosis and a variety of estrogen-mimicking pollutants. And the Milwaukee-based Endometriosis Association is desperately seeking scientists to do more tests on the monkey colony that Rier studied before the females reach menopause in 1995.

"We've wondered for a long time why there seems to be such a huge increase in the number of women with endometriosis," said Mary Lou Ballweg, president of the association. "The theories relating to hormonally active chemicals, plus our own scientific work, seem to provide a possible answer to the conundrum. But if it is the answer, it's a frightening answer because it's not just a nightmare for this generation but for succeeding generations as well."

Damage to Wildlife

The strongest case for environmental estrogens affecting fertility comes from animals and birds that have been contaminated by these compounds.

Louis J. Guillette Jr., a wildlife endocrinologist at the University of Florida, has found that alligators in Lake Apopka in central Florida have extremely low birth rates. Those that hatch, moreover, are predominantly female. And the few that are male have phalluses that are up to 75 percent shorter than average. The problems are almost certainly due to residual concentrations of DDE from a lakeside spill of dicofol and DDT 10 years ago.

See ESTROGENS Page 12

WASHINGTON POST HEALTH JANUARY 25, 1994

Carlos Sonnenschein and Ana Soto of Tufts University discovered that the plastic in their laboratory flasks was contaminating cell samples with an estrogen-like compound.

Niels E. Skakkebaek found that sperm counts dropped 50 percent worldwide between 1938 and 1991, and he suspects that environmental estrogens were the cause.

ESTROGENS, From Page 11

In his laboratory, Guillette and fellow endocrinologist Timothy Gross reproduced the conditions of the lake. They painted alligator eggs with the same doses of DDE now lingering in the lake (concentrations low enough to be measured in parts per billion) and saw the same range of reproductive problems: Only 10 percent of the eggs hatched, and again most were females. It seems the feminizing pollutant literally changes most of the males to females before they're born, Guillette said.

Other wildlife biologists have seen similar problems in the species they study. Michael Fry, an avian physiologist at the University of California at Davis, has examined birds in parts of the United States where concentrations of PCBs are highest. He found that gulls and terns are feminized: The females have extra egg-laying organs and males have a mix of male and female reproductive structures.

In addition, David Crews and his colleagues at the University of Texas have shown that very low doses of estrogen-mimicking chemicals applied to the shells of turtle eggs can induce ovary formation in otherwise male turtles.

Environmental Dilemma

Suggestive as all this research is, it is not conclusive, and it could take decades to document any cause-and-effect link between estrogen pollutants and reproductive problems. "It took 40 years of data and 50 studies before the Surgeon General made his report [on cigarette smoking] in 1964," said Devra Lee Davis, senior advisor to assistant secretary for health Philip R. Lee. "Now what do you expect in a situation that's even harder to sort out, and when the chemicals in question have in many cases important industrial uses?"

That's a point chemical manufacturers are quick to make too. Concerned that consumers and regulators might overreact to preliminary findings, the industry is trying to find out for itself whether chemical estrogens actually pose a health risk. The Chemical Manufacturers Association (CMA) and the National Agricultural Chemicals Association (NACA), for example, are providing some support for a study of DDT-exposed women in South Charleston, S.C.

"We're extremely interested and concerned about the growing body of information, but we hope that others still realize how uncertain this all is," said Allison Rapala, health issues coordinator for the Chlorine Chemistry Council, a member of the CMA. "We're dealing with a gray area and products that have improved life and that has to be weighed in the balance."

John McCarthy, NACA's vice president for science and regulatory affairs, said that manufacturers are already required to perform two-generation animal studies that provide ample data on the hormonal effects of agricultural chemicals. "Our belief is that if there were such problems our tests would detect them," he said. "It's hard for me to fathom that some terrible things are happening out there, but we're always open to improvements in our tests."

It was in the course of trying to develop such a test that Ana Soto, a Tufts University endocrinologist, found out just how widespread environmental estrogens are.

Soto and her colleague Carlos Sonnenschein were experimenting with cultured breast cancer cells that grow only when given estrogen. The cells may someday serve in an assay to see whether certain chemicals mimic estrogen: Just drench the cells with the substance in question and see whether they grow. But one day the test stopped working. From that day onward, the cells kept growing, even when no estrogen was added.

After four months of frustration, Soto figured out that the company making the disposable flasks in which she was growing her cells had begun using a slightly different plastic—one that sheds tiny doses of the estrogen-like compound nonylphenol every time it's heated. As a result, her experiments were being contaminated by leaking estrogens without her knowledge. Soto solved the problem by switching to glass flasks, but her bigger concern is now outside the laboratory.

Most companies don't reveal what kind of plastic is in their products, she said, and probably have no idea whether they slough off estrogen-like molecules when used, for example, to heat leftovers in a microwave. "I am posing a problem here," she said. "We don't know this is causing problems in people, but it's a good hypothesis."

Even if studies do find health effects from chemical estrogens, no easy solution is in sight, said Penelope Fenner-Crisp, director of the EPA's health effects division. Some of the more potent compounds, including DDT and some PCBs, are already tightly restricted in this country, but they and their breakdown products will persist in soil and water for decades to come. Others, such as various plastics, play critical roles in industry, agriculture and everyday life.

Virtually everybody in the U.S. is contaminated with measurable quantities of DDE, PCBs and other estrogen mimics, scientists said, and exposure to some of these compounds is bound to increase. But until their effects are better known, they said, it's impossible to know what to do about it.

"It's very possible, and it's frightening, that we might be drowning in this sea of estrogens," said Stanford endocrinologist David Feldman. "There are lots of estrogens everywhere, we now know. But it is not a proven problem, and it's still just something that we ought to be looking into more." ●

Although estrogen is commonly referred to in the singular, there are many kinds of estrogen. They are made by both men and women as well as by animals, but are made in much greater quantities in females than in males.

The three major varieties of estrogen made in the human body are 17 beta estradiol (the most potent and prevalent), estrone and estriol.

● In women, estrogens are made mostly in the ovaries, but smaller amounts are produced by the adrenal glands, the placenta and even in fat cells. Estrogen production begins before birth, peaks after puberty and declines with menopause. In the fetus, estrogens stimulate uterine and ovarian development. At puberty, they trigger uterine growth and breast enlargement. Their monthly pattern of secretion is a key regulator of the menstrual cycle. Estrogens also lower blood cholesterol levels and help maintain bone mass.

● In men, small amounts of estrogen are made in the testes. Both men and women can turn estradiole into testosterone and vice versa.

● In the environment, many chemicals and pollutants resemble estrogens in their effects on the body. Various pesticides and their breakdown products, industrial chemicals including polychlorinated biphenyls, and plastics like those used in water containers and baby bottles are major sources of environmental estrogens.

● In medicine, estrogens are used as drugs to treat a range of medical conditions. The main type of estrogen in birth control pills is estradiole. Hormone replacement treatment for menopausal women consists of a cocktail of several estrogens, primarily estrone.

● Estrogens cause physiological changes in the body by attaching themselves to certain receptors inside the body's cells. Scientists are finding that these receptors are not especially picky, so the imposter estrogens in pesticides and other chemicals can attach to these receptors and mimic the effects of human estrogen.

FORUM

Breast Cancer's Link to Estrogen Exposure

Many of the things that increase a woman's risk of getting breast cancer, including early puberty, late menopause and lifelong childlessness, have one thing in common. They increase a woman's lifetime production of the female hormone estrogen. Now some scientists are starting to wonder whether estrogen-mimicking pollutants may be adding further to that hormonal burden and to the risk of breast cancer.

So far the evidence is only indirect. A few studies have shown, for example, that women exposed to estrogen-like chemicals such as polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) have higher rates of breast cancer than women not exposed to those compounds. But other variables like diet, exercise or exposure to other chemicals might also account for the difference.

In the largest study yet to look at the issue, Mary S. Wolff of the Mount Sinai School of Medicine in New York tracked more than 14,000 women between 1985 and 1992, during which time 310 were diagnosed with breast cancer. Laboratory analysis showed that the women with higher levels of DDE in their breast tissue were more likely than others to get breast cancer. DDE is an estrogen-mimicking breakdown product of the now banished insecticide DDT, which was sprayed liberally in New York when the women in the study were growing up.

In another study about to be published in the Journal of the National Cancer Institute, Canadian researchers found a link between DDE levels in breast tissue and the odds of getting a particular kind of breast cancer—the type that feeds on estrogen. Such "estrogen sensitive" breast tumors have made up a larger and larger portion of the increase in breast cancer in recent years, according to Wolff.

Still, some studies have failed to find an association between environmental estrogens and breast cancer. To help settle the issue, the National Cancer Institute plans to include a careful assessment of women's exposure to pesticides and other estrogen-like compounds when it starts a major investigation of breast cancer later this year in Long Island, where breast cancer rates are 27 percent higher than they are in the rest of the country. Among environmental estrogens that will be tracked are DDT, DDE, PCBs and PAHs.

Estrogens and Food

Animals have no monopoly on the production of estrogens. Many plants make estrogens or estrogen-like compounds, called phytoestrogens, and plant-eating animals and people get potentially significant doses of these hormones in their diets.

Phytoestrogens can affect animals in major ways. Pigs can suffer from uterine overgrowth when they eat moldy corn that's rich in estrogen-mimicking compounds called zearalenones. Sheep that eat too much estrogen-rich clover show other signs of hormone overload, including high miscarriage rates.

Scientists don't know to what extent estrogens in human diets may be adding to the total estrogen load in the body. But some researchers are convinced that there are "good" estrogens and "bad" estrogens—much as physicians today distinguish between good and bad cholesterol—and that good estrogens in foods might actually help protect against cancer.

Researchers know that when estradiole, the body's No. 1 estrogen, gets broken down in the body, there are two different metabolic pathways it can follow. One final estrogen product appears to promote cancer, while the other may protect cells from cancer. According to one hypothesis, certain ingredients in food (such as the cancer protective compound in broccoli, indole-3-carbinol, and the healthful omega-3 fatty acids found in some fish) encourage estrogens to get metabolized to the "good" estrogen, called 2-hydroxyestrone. Other foods and some chemicals, such as the pesticide ingredient DDE, increase the amount of estradiole converted into the "bad" estrogen, called 16-alpha hydroxyestrone.

This theory was recently proposed by H. Leon Bradlow of the Strang-Cornell Cancer Research Laboratory in New York and Devra Lee Davis of the Department of Health and Human Services. While other scientists said they are waiting for more evidence before accepting the hypothesis, there is general agreement that certain estrogen-like ingredients in food can protect against cancers of the breast and reproductive system. Among the best anti-cancer candidates, said Herman Adlercreutz, a nutritional chemist at the University of Helsinki, Finland, are foods rich in so-called isoflavonoids, which are estrogen-like compounds found in soy products like tofu, tempeh and miso, and foods high in lignin, such as rye bread.

Should Doctors Make Regular House Calls?

Yes. You learn a lot more about your patients when you make house calls. The knowledge you gain can be critical in providing the best advice and treatment. A patient might tell you everything's fine, for instance, but when you visit the home you see dirty dishes in the sink or clothes scattered on the floor.

That could be the first indication of Alzheimer's disease—or merely of an emotional problem needing attention.

I had one patient who could not get around very well because of a bad hip. In the office, I asked whether she needed assistance at home. She said a friend nearby offered all the help she required.

But when I went to visit the patient, I could see no one really spent much time with her. Worse yet, her house wasn't easy to get around in. To get upstairs, she had to climb a ladder. Moreover, the house was in a remote part of town, far off in the woods and down a hill. She was typical of many older patients in that her perception of her life was quite different from how others would see it.

When you make a house call, you're also sending a powerful message to patients. You're showing them you really care. I think people are sick of waiting long periods of time in office lobbies to see a physician for 10 minutes.

Kaiser, one of the most efficiently run HMOs, has found it cost-effective to have doctors on staff who do nothing but make house calls. Why shouldn't other practicing physicians make house calls too?

The doctor whose main concern is the number of patients he sees in one day would never go for it. But over the years, I've built a very stable practice that includes house calls.

If fewer doctors make them in the future, I think you'll see many patients place a higher value on those MDs who take the time to see them at home.

— **Lawrence White**
Clinical professor of medicine, University of California at San Francisco; past president, California Medical Association; medical oncologist

No. Like most doctors, I don't have the time to make house calls regularly, because I'm burdened by responsibilities unrelated to patient care. Often, they take most of a working day.

For example, it's not uncommon for me to spend several hours just doing paperwork—whether it's completing forms to receive payment from insurance or filling out the legal documentation that's necessary for some prescriptions.

I frequently find myself on the phone because of problems unrelated to patient care. A few weeks ago, I spent more than an hour on the phone with someone from Social Services so a patient wouldn't lose certain benefits.

While I enjoy making house calls, they can be very time-consuming. In the small city where I practice, it can mean an hour or even more per visit. If it's an emergency, a house call makes sense. But during many house calls, only minor problems are addressed. Many problems dealt with during house calls actually require just a few minutes on the phone. I make myself easily accessible by phone, and patients appreciate this. Many are just as busy as I am. What's more, they like the fact that they can call me when they are troubled and not have to worry about being charged for the service.

I enjoy making house calls that are necessary. With a dying patient who can't come to the office, it can be invaluable. Not only is it good for the patient, but also it's comforting for the family. It shows them I'm doing all that can be done.

I don't think there's a doctor out there who wouldn't like to make more house calls, but it's virtually impossible to do so nowadays without driving up your costs substantially and sacrificing the time you can spend with other patients.

— **Richard Foss**
Internist, hematologist and oncologist, Yonkers, N.Y.

International Joint Commission
Commission mixte internationale

Supplemental Information to the Seventh Biennial Report

Recent human health, wildlife and laboratory studies lend further support to the International Joint Commission's conclusion that exposure to persistent toxic substances is the most significant problem facing the Great Lakes region. Among the more recent concerns is the ability of various persistent toxic substances to disrupt natural hormone systems and interfere with critical stages of fetal development.

The Commission is convinced that the time has arrived for all sectors of society to move beyond the politics of confrontation and denial. The severity of the problem, and potential risk to the reproductive, physiological and intellectual faculties of future generations, all point to the need for consensus building on a comprehensive persistent toxic substances strategy.

- Breast, prostate and testicular cancer, which are mediated by hormonal activity, are increasing in humans, particularly in industrial countries. A long-term study of women in New York found that those who developed breast cancer had significantly higher blood levels of DDE, a pesticide breakdown product, according to Dr. Mary Wolff, Mt. Sinai School of Medicine.

- Male human reproductive tract disorders in the United Kingdom have more than doubled in the past 30-50 years while sperm counts have declined by about half, according to Richard Sharp, Centre for Reproductive Biology, Edinburgh. Similarity of the abnormalities to those of sons whose mothers took the synthetic hormone diethylstilbestrol (DES) during pregnancy indicates they may be related to exposure to estrogenic substances before birth.

- The first generation of humans widely exposed to synthetic chlorinated organic chemicals in the womb was born during the 1950s-1970s and began reaching reproductive age in the 1970s. Male children born to mothers exposed to PCB-contaminated cooking oil in Taiwan, who are now age 11-14, were found to have significantly shorter penises than children in a matched control group. Y.L. Guo, National Cheng Kung University, Taiwan, also found that female children had shorter body height and suggested that both developmental effects may be related to hormonal changes caused by toxic exposure. The exposed children consistently scored lower on cognitive ability tests according to T.J. Chen.

- Increased rates of leukemia and bladder cancer were found in Cape Cod communities exposed to tetrachloroethylene that leached from the vinyl liners of drinking

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effects. Similar altered sexual development was found in another mollusc, the dogwhelk, on both sides of the North Atlantic, including pronounced sexual alterations and population declines close to centers of boating and shipping activities, according to G.W. Bryan, Plymouth Marine Laboratory, Plymouth, United Kingdom.

○ Trout of both sexes placed at the outfalls of sewage treatment plants across Great Britain rapidly developed abnormally high levels of vitellogen, an egg-yolk protein produced in response to estrogen activity, and male fish had reduced growth rates and gonad size. The suspected agents were alkyl phenols, estrogenic substances liberated from the breakdown of detergents released with treatment plant discharges, according to John Sumpter, Brunel University.

○ In laboratory tests on rats, a single dose of TCDD, the most toxic form of dioxin, administered on day 15 of pregnancy was sufficient to cause delayed testes descent, reduced production of testosterone, impaired sperm production and demasculinization of sexual behavior, according to Richard Peterson and colleagues, University of Wisconsin.

○ In testing exposure on pregnant rodents, the U.S. Environmental Protection Agency found that dioxin perturbs production of hormones and growth factors. Offspring showed severe weight loss, immune system suppression, atrophied testes and a 60 percent decrease of sperm cells in ejaculate. In addition U.S. EPA researchers found that humans are sensitive to the effects of dioxin and that the body burden in the general population is near or at the level expected to produce biological responses.

○ A direct correlation between dioxin exposure and endometriosis in a Rhesus Monkey colony was found by Sherry L. Rier, University of South Florida. In exposed animals, 70 percent developed endometriosis and the disease increased in severity with the amount of dioxin exposure. Minimal disease was found in control monkeys.

○ A tool to assess the estrogenicity of environmental contaminants, called the E-SCREEN test, has been developed by Drs. Soto and Sonnenschein at Tufts University. They also reported that plasticizers such as nonyl phenol and other alkyl phenols, found to leach from plastic labware, mimic estrogen action both in human cells in culture and in the uterus of rats. Nonyl phenols were also found to leach from polyvinyl chloride tubing used for milk processing. Drs. Soto and Sonnenschein found that endosulfan, a commonly used pesticide, is also estrogenic.

○ Forty-two chemicals, or classes of chemicals have been reported to affect the reproductive or hormone systems. Twenty-three of these compounds contain chlorine as an essential ingredient.

GREAT LAKES INITIATIVE

THE GREAT LAKES WATER QUALITY INITIATIVE

A GIANT STEP FORWARD

COMMENTS ON THE U.S ENVIRONMENTAL PROTECTION AGENCY'S PROPOSED GUIDANCE

PURSUANT TO THE
GREAT LAKES CRITICAL PROGRAMS ACT

Submitted on behalf of:

NATIONAL WILDLIFE FEDERATION

CITIZEN ACTION

GREAT LAKES UNITED

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THE GREAT LAKES WATER QUALITY INITIATIVE

A GIANT STEP FORWARD

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Downriver Citizens for a Safe Environment
Eco-Action
Ecology Center of Ann Arbor
Environmental Coalition (Erie County, PA)
Environmental Concerns Committee of St. Catherines Church, Milwaukee
Environmental Defense Fund
Environmental Issues Task Force of the First Unitarian Church of Rochester (NY)
Environmental Planning Lobby
Environmental Working Group
Florida Wildlife Federation
FOCUS, Lake Superior Basin
Friends of the Detroit River
Friends of the Land of Keweenaw
Friends of Wehr Nature Center
Friends of Wetlands, Ohio
Genesee Ornithological Society
Genesee West Audubon Society
Georgia Wildlife Federation
Grand Cal Task Force
Great Lakes Beach Sweep - Lake Erie Division
Great Lakes United
Greater Cleveland Nurses Association
Greendale Environmental Group (WI)
Hoosier Environmental Council
Indiana BASS Chapter Federation
Indiana Rifle and Pistol Association
Indiana Sportsman's Roundtable
Indiana Wildlife Federation
Izaak Walton League of America
Izaak Walton League, Indiana Division
Izaak Walton League, Ohio Division
Izaak Walton League, Minnesota Division
Izaak Walton League, Wisconsin Division
Lake Erie Basin Committee of the League of Women Voters
Lake Michigan Federation
Lake St. Clair Advisory Committee
Lake Superior Greens
League of Ohio Sportsmen
Metro-Act of Rochester (NY)
Michigan Audubon Society
Michigan Environmental Council
Michigan Nature Association
Michigan State Medical Society
Minnesota Conservation Federation
National Audubon Society
National Wildlife Federation
Natural Resources Defense Council
NY Sustainable Agriculture Working Group
North Dayton Anglers & Gun Club
Northeast Ohio Greens
Oakwood Environmental Concern Assoc.
Ohio Environmental Council
Presque Isle Audubon Society
Save the Dunes Council
Sierra Club
Sierra Club, Pennsylvania Chapter
Tip of the Mitt Watershed Council
Washtenaw County (MI) Drain Commissioner
West Michigan Environmental Action Council
Wetlands Conservation Association
Whitnall Park Natural History Society
The Wild Ones Natural Landscapers, Ltd. (Milwaukee)
Wisconsin Wildlife Federation
World Wildlife Fund

THE GREAT LAKES WATER QUALITY INITIATIVE

SUMMARY STATEMENT

The proposed Great Lakes Water Quality Initiative (GLI), if adopted, will be a giant step forward in efforts by the United States and the eight Great Lakes States to protect and restore the quality of the Great Lakes.

Current Great Lakes programs are not enough. Although the GLI needs to be strengthened, even as proposed it would result in major improvements in management of the Great Lakes. The proposed GLI deserves support from everyone who cares about the Great Lakes region and the health of its inhabitants.

1. THE GLI WILL REDUCE TOXIC POLLUTION:

▸ **The GLI must be adopted because it will reduce by about 80 percent the dumping of toxic pollution by cities and industries into the Great Lakes.**

Dioxin, mercury, PCBs, lead—and other chemicals with overwhelming evidence of causing cancer, birth defects and developmental problems in people and wildlife—still are legally dumped with the wastewater of many cities and industries.

The GLI will require all eight Great Lakes States for the first time to adopt consistent standards and manage the Great Lakes as an ecosystem. Overall, the GLI will reduce by about 80 percent the dumping of toxic pollution into the Great Lakes and tributary rivers from waste pipes from industries and cities.

2. THE GLI IS A GIANT FIRST STEP:

▸ **The U.S. Environmental Protection Agency should immediately undertake "Round 2" of the GLI to develop measures for:**

- **setting timetables to ban uses of persistent and bioaccumulative toxic substances released into the Great Lakes Ecosystem;**
- **ensuring that all sources of pollution are controlled and do not violate GLI water quality standards; and**
- **requiring comprehensive pollution prevention programs for the Great Lakes.**

No provision is included in the GLI to require sunsetting (phasing out) the uses of persistent toxic pollutants, consistent with the philosophy of zero discharge mandated by the U.S.-Canada Great Lakes Water Quality Agreement. Even after the GLI's most stringent controls are imposed, substantial amounts of these pollutants will be allowed to be discharged from industry and city wastewater pipes.

New water quality standards set by the GLI will apply to all sources of pollution of waters in the Great Lakes Basin. But procedures are not yet proposed to ensure that pollution from diffuse ("non-point") sources of pollution meet the GLI standards. Such sources include air pollution that falls into waterways, urban and farm runoff, city sewer overflows during storms, pollution from contaminated sediments, seepage from landfills, and spills.

3. THE GLI WILL PROTECT PEOPLE AND WILDLIFE:

▸ **Special restrictions in the GLI on toxic pollutants that build up in Great Lakes fish must be adopted. The GLI needs stricter rules, however, to protect everyone exposed to Great Lakes fish contaminants, particularly those most sensitive to toxic injury and those, especially including Native Americans, who rely on fish and wildlife for sustenance and cultural preservation.**

The health of people who eat Great Lakes fish is jeopardized by toxic chemical pollution. Especially at stake is the health of children of sport anglers, Native Americans and other families that eat large amounts of Great Lakes fish.

With the GLI, for the first time the introduction of additional toxic pollutants will be controlled based on their potential to accumulate in the food chain. This is important because contaminated Great Lakes fish are the main way most people are exposed to toxic pollution.

People should be able to eat as much Great Lakes fish as their tastes, culture or subsistence needs dictate, and consume those fish without having to worry about what harm that diet may do to themselves or their offspring.

4. THE GLI WILL PLUG DILUTION LOOPHOLES:

▸ **Pollution dilution zones for persistent, bioaccumulative toxic substances must be phased out, as proposed by the GLI. The pollutants affected by this ban, however, must include all persistent toxic substances and the phase-out must be accelerated.**

Today, standard operating procedure is to allow Great Lakes polluters to dilute their wastes before meeting water quality standards. But many of these toxic pollutants are persistent in the environment and build up in the food chain. Also, dilution ignores the unusually slow flushing time of the Great Lakes.

The GLI proposes to phase out some uses of dilution as a "solution" to pollution for the most dangerous and persistent toxic chemicals. Within ten years of final approval of the GLI, nearly all mixing zones for such pollutants will be banned.

5. <u>THE GLI PROPERLY SHIFTS BURDENS TO POLLUTERS:</u>

▸ **The GLI properly shifts the burden of proof to dischargers and requires they demonstrate that their discharges will not damage the health of people and wildlife, as well as fish and other aquatic life.**

Regulators frequently do not use the data that is available to set permit limits for toxic pollutants. As a result, dangerous pollutants go unregulated. Dischargers have no incentive under this system to provide more data about their pollution.

The GLI begins to shift the burden of proof regarding a pollutant's safety onto the polluter. Whatever information available on a pollutant will be used to set discharge limits, with conservative safety factors used. More studies demonstrating environmental safety could be used to relax discharge limits.

6. <u>THE GLI GIVES LAKE SUPERIOR SPECIAL PROTECTION:</u>

▸ **The GLI must designate the U.S. portion of Lake Superior as an "Outstanding National Resource Water" in order to protect its high quality waters through pollution prevention.**

Lake Superior is the crown jewel of the Great Lakes because it contains the highest water quality of all the Lakes. Therefore, protecting it from toxic pollution is a special challenge that will require putting measures into place to <u>prevent</u> pollution in the future.

7. <u>THE GLI LIMITS TOXIC POLLUTION FROM NEW SOURCES:</u>

▸ **The GLI antidegradation procedures must be adopted to prevent new or increased dumping of pollutants that persist and build up in the food chain.**

Current policies in the Great Lakes allow new or expanding facilities to dump increased levels of toxic pollution. Even though the federal "antidegradation policy" limits such increases to where there is a significant economic or social benefit, the Great Lakes States have not fully implemented this policy.

The GLI specifies detailed antidegradation review procedures for the Great Lakes, with special emphasis on preventing new or increased dumping of toxic pollutants that build up in the food chain. The GLI requires that dischargers use pollution prevention techniques to reduce or prevent pollution in such cases.

SIERRA CLUB

MIDWEST OFFICE

214 N. Henry St. Suite 203 Madison Wisconsin 53703 (608) 257-4994

Twenty years of protecting the Midwest's environment

August 3, 1993

Tim McNulty
Council of Great Lakes Governors
35 East Wacker Drive, Suite 1850
Chicago, IL 60601

Re: DRI McGraw-Hill Study of Costs of GLI

Dear Mr. McNulty:

Included is an economic analysis we had commissioned by several University of Wisconsin economic researchers. You will see that we have grave doubts about both the methodology and the findings of your study. We feel that, in fact, your study is at best dubious and, at worst, bogus.

I want to make you understand in the most certain terms that we will hold you and the governors accountable for the sloppy and incomplete manner in which this study has been handled.

Our criticism can be categorized in the following ways.

1. **Lack of thorough benefit analysis, especially in the tourism area.** Tourism is the major industry affected by Great Lakes pollution. The fact that you consider fish advisories and not the rest of the $76 billion Great Lakes tourist industry is a major oversight.

2. **Faulty cost-effectiveness analysis**, to quote these economists, "should never be used to decide whether an approach is worthy of pursuing from society's point of view." While we realize that this is an honest attempt to try to deal with some of those costs, we feel it does not provide us meaningful answers.

3. **Uncertain treatment of uncertainty.** We have grave concerns for your treatment of uncertainty, especially the fact that the level of certainty of the four scenarios that you evaluated is never really made clear to the reader.

Tim McNulty
August 3, 1993

4. **Using bogus cost figures.** The costs that you assume for the GLI were based on industry projections, which can range anywhere from 10 to 100 times greater than what the actual costs will be. This could explain the great difference between your cost estimates and the EPA's estimates.

Also, the fact that the DRI study did not place any certainty on the job loss ranging from 8,600 to 33,000 jobs per year casts doubt on the findings. It should be noted in our study, Clean Lakes, Clean Jobs, that we found that 2.9 million jobs and $95 billion in commerce are at risk to a dirty Great Lakes. So obviously, the losses in the 8,600 range are statistically insignificant.

You can see our economists have several other important criticisms. The number one thing I would stress for you to do is to send DRI McGraw-Hill back to the drawing board. Do not use the findings, which are being widely quoted and misrepresented, for public discussion.

One additional item, I do not understand why DRI McGraw-Hill should be in the business of making policy recommendations, especially when it comes to eliminating mixing zones. This is by far one of the most important parts of the Great Lakes Initiative. And other areas like load reduction credit for the mercury criteria and the lifetime of permits, we feel this is up to EPA, and not McGraw-Hill, to make these decisions.

So, again, thank you very much for sharing this with us. I am sorry we found this work to be lacking. We hope that you improve these areas, especially accounting for benefits of a clean Great Lakes to include the $75 billion tourism industry is vitally important.

Thank you very much. If you have any questions regarding this letter, please feel free to contact myself or our economists, the Johnsons.

Sincerely,

Brett Hulsey
Great Lakes Program Director

cc: Great Lakes Governors

Introduction

There are four categories of problems with the DRI report that warrant further discussion and possible elaboration by DRI.

- DRI's comparative advantage is in macro modeling, not cost effectiveness analysis. The linkages among the Great Lakes economies seem to be well developed and the model well specified. As cost-effectiveness analyses go, however, this is actually rather crude, incorporating few of the techniques now common to such analyses in the presence of multiple outcomes and significant uncertainty. Even the basic purview of a cost effectiveness analysis was not entirely respected as the analysis frequently strays into the realm of a cost benefit analysis.

- The analysis repeatedly ignores the horrendous transactions costs that characterize abatement of non-point sources of pollution. There is, in fact, an economic reason why society has not addressed non-point pollution. Whether point or non-point abatement is more cost effective at this point is far from a given and certainly an empirical question that begs investigation.

- The results of the sectoral analysis through the macro model does not take into account the structural shift in the economy that can be expected when the economy becomes "cleaner". More than initial construction jobs are created when new technologies are developed.

- DRI's agenda appears to be to build the strongest case possible for jettising a regulatory approach in favor of an approach that stresses market solutions. That the outcomes achieved using the different approaches are the same is in fact open to debate and not as obvious as DRI would like it to be.

In the section that follows, each of these four areas of concern are discussed in more detail. Though pot shots are always fun, we do think there are some significant areas where the study is weak.

Quality of the Cost Effectiveness Analysis

Purview of Cost Effectiveness Analyses

Cost-effectiveness analysis is a technique that is used to compare the relative cost effectiveness of two or more policy approaches to one policy problem. It is therefore a relative concept that **should never be used to decide whether an approach is worthy of pursuing from society's point of view.** Such "go; no-go" decisions can only be made using full blown cost-benefit

analysis.

DRI repeatedly stretches the purview of the technique throughout the report. Admonishments like, "proceed with caution" (p. II-2, II-3) imply that the analysis has some relevance to the proceed-do not proceed decision. It does not. Furthermore, discussions of EPA benefit valuation techniques (ES-8, V-21-23), where monetary values are imputed for the benefits, have no place in a cost-effectiveness analysis, other than to attack the overall credibility of the EPA RIA in general.

The objective of the evaluation, as stated by DRI, was to evaluate the relative cost effectiveness of provisions of the GLI. Statements regarding the relative cost effectiveness of addressing non-point pollution, a problem that was never intended to be part of the GLI, redefine the scope of the analysis. For example, "Ironically, because these strategies have not been pursued with vigor to date, the first round of elimination of these pollutants would likely be far more cost-effective than most of the GLI provisions selected by DRI for reconsideration." (p. II-3). Unless there is some possibility of including non-point source abatement in a revision of the GLI, this entire subject serves to obfuscate the analysis.

Furthermore, it is far from clear that non-point source abatement would be more cost effective anyhow. Enormous transactions costs are present when addressing non-point sources of contamination. Policies to change the behavior of millions of producers are difficult to develop and implement, and nearly impossible to enforce. In the language of DRI's cost benefit framework, non-point abatement measures would be at an earlier point along the incremental cost of clean-up curve than point source abatement, **but the underlying production function is entirely different, resulting in an entirely different cost curve.** That society would be at an earlier portion of a different curve doesn't say much.

In fact, the entire issue of the relative cost effectiveness of point versus non-point abatement is an empirical question that deserves the kind of in depth analysis that was performed in this study of the GLI. This is a tremendously complicated issue in its own right. For example, atmospheric deposition of toxics involves contamination sources from states out of the region, never mind other countries. Clearly non-point source abatement is beyond the purview of this analysis.

Quality of Outcomes Measures

That there are a myriad of outcomes that will result from the GLI is obvious to anyone. The greatest strength of cost effectiveness analysis as an evaluation tool is that it enables the analyst to examine multiple impacts without being constrained by having to assign monetary values to outcomes. The decision by

DRI to use loadings reductions and changes in beneficial uses seems credible, but limiting. Tourism was not included as a beneficial use, despite the importance of lake-related tourism to the region's economy. The relationship between loadings reductions and tourism is nebulous, but this is a condemnation of the outcomes measurement approach itself, not of including tourism.

A larger problem with the approach used to measure outcomes is that neither outcome measure captures the impact of the program on institutional development. Institution building was, in fact, the primary motivation for the formation of the Council of Governors and the GLI in the first place. Had some measure of institutional development been included, for example the degree of interstate consistency in abatement limits and enforcement thereof, the relative effects of the four scenarios on institutional development could have been systematically analyzed. As it is, institutional ramifications of the GLI are relegated to footnotes, such as the note regarding the potential bargaining leverage showing progress on the GLI would generate for negotiations with Canada (p. ES-5).

In DRI's defense, they developed their study objectives in response to a directive from the Council of Great Lakes Governors to evaluate the economic and environmental impact of the GLI. An evaluation of the institutional impact of GLI was therefore absent from the original directive. The lesson here is that the Council needs to recognize that their authority to determine the "rules of the game" through institutional development has tremendous economic significance, something that should be incorporated into all economic analyses.

Treatment of Uncertainty

There is clearly an enormous amount of uncertainty inherent in this analysis. The distinction between technological and regulatory uncertainty in the analysis is appropriate, though a more thorough assessment of institutional outcomes of the GLI would have enabled a more systematic evaluation of regulatory uncertainty in the analysis. How these sources of uncertainty were incorporated into the four scenarios evaluated is never really made clear to the reader. How much of the total projected costs were uncertain? How important are the cost "spikes" relative to the estimated total costs of the program?

Furthermore, though high and low cost scenarios were projected for the two basic approaches, no probabilities were assigned to them. Based on the data, should the reader assume that the best and worst case scenarios are equally likely? This becomes a very significant issue when the report begins to examine, say, the employment effects of the different scenarios. There is a huge difference, political speaking, between the loss of 8,600 potential jobs and 33,000, yet the reader is given no indication

of relative probabilities.

Beyond simply assigning and reporting probabilities, in the presence of significant uncertainty, cost effectiveness analysis should include a sensitivity analysis on all the major assumptions used in developing the alternatives. For example, the DRI report uses a cost range that is significantly higher than that used by the EPA because their underlying assumption about the ability of the private sector to adopt cost minimizing technologies was "less optimistic" (p. ES-1). Given the global competition faced by the industries involved, it is difficult to fathom why they would not aggressively explore least cost options. But regardless, this is a classic example of a situation begging for a sensitivity analysis. How sensitive are the cost estimates to this assumption about technological adoption?

Sectoral Impacts

DRI is clearly in its element when it comes to designing and churning out results from its macroeconomic model of the Great Lakes regional economy. Their equations are as accurate as anyone's, but there is a prior issue here. That is, macro simulations use simultaneous equations to model the economy in its current form. As such, they are not particularly well suited to predicting what will happen in the future when a policy is designed to change the underlying structure of the economy.

One way you can see this bias in the study is that the only stimulative impact of the GLI on the economy in the model was through the initial construction jobs created. What was missing is any new industries that would be created to design and manufacture the abatement technology, for example. The GLI could, for example, spur the region to become the leader in the development of abatement technology with global applications. This kind of thinking, environmental abatement as a business opportunity for a region as opposed to a business threat, is something that the Japanese are embracing on a global level. There is a lesson here.

This is not to say that there would not be some business closings as a result of the GLI. How many is difficult to ascertain. Businesses close for many reasons, often an accumulation of reasons. At the margin, the GLI would no doubt close some businesses, the ones for whom abatement was prohibitively expensive due to the nature of the business or the quality of it management. It is easy to blame environmental regulation when a company closes; difficult to admit to poor management. In any event, the estimates of how many businesses would close and jobs would be lost are all presented without any indication of how likely the scenarios are and what assumptions were made when deriving them.

Predilection for Market Solutions

Most economists, indeed most taxpayers, want to see public policy made in such a way that it accomplishes the objective defined by the public as efficiently as possible. Market solutions to environmental problems hold the promise of helping introduce the efficiency of the market into the arena of public policy--economists in general and DRI in particular appear to love them. Indeed environmentalist could grow to love them if the market incentives were designed appropriately to solve the same problem regulation would have solved.

Three questions need to be answered when evaluating the appropriateness of market solutions to a public policy situation:

- Does the market solution address the same problem that a regulatory approach would address or some convenient variation of it? IF the answer is the latter, does the convenient variation mean that some meaningful aspect of the problem will not be addressed?

- Does the appropriate set of institutions and incentives exist to support the market solution?

- What are the equity implications of the new approach?

In the case of the GLI, DRI identified the sources of the 4 cost spikes they identified and proposed alternative solutions that would alleviate the spikes. Some of the solutions used market incentives, some variations on the regulatory approach. From an economic perspective, some of the recommendations were better thought out and more appropriate than others.

Intake Credits

Intake credits is the solution recommended for the potential problem of the prohibitive cost to users of bringing discharges into compliance when the water was beyond the acceptable level at intake. Asking users to become, in effect, lake water filtration systems would obviously impose a significant cost. If, however, a goal of the policy was to actually filter lake water, then the use of intake credits would change the problem the policy was designed to address. Such credits would be a workable policy, however, as existing regulatory bodies could monitor intake levels. The solution would also be more equitable than a strict interpretation of the existing guidance.

Elimination of Mixing Zones

DRI estimated that the elimination of mixing zones accounted for approximately 25% of the difference in cost between scenarios A and B. Whether this proportion was estimated using the low or high scenarios was never indicated, leaving the reader with no

idea of the opportunity cost involved. According to DRI, the elimination of mixing zones was proposed as a way to reduce loadings of BCC's. They go on to asserted that, "it is not clear that the additional loadings reduction could not be obtained much more cost effectively from other sources" (p. II-8). The alternatives posed include allowing mixing zones, implementing multiple source TMDLs, credit trading or atmospheric deposition credits, all of which accomplish slightly different objectives in a variety of ways with varying cost and equity impacts. More investigation of the relative merits of each approach would seem to be in order, rather than simply asserting that the elimination of mixing zones is a bad idea.

Loadings Reduction Credits

DRI recommends the use of tradable loadings reduction credits to overcome the impediments to development inherent in an anti-degradation policy. Such credits, if properly allocated, could be used to preserve the current rate of loadings, slow it or accelerate it. New institutions would have to develop to handle the trading of these credits. As is always the case with credit trading, the equity of the resulting solution is often questionable as who "cleans up their act" ends up being the company that can do it most cheaply, not necessarily the one that pollutes the most.

The allowance for important social or economic benefit is another area of concern. As pointed out in the DRI study, in the absence of more specific criteria this could become a giant loop-hole in both the anti-degradation and the loadings reduction credits program.

Mercury Criterion

The DRI study identifies the mercury criteria as a significant cost spike (again, what is the relative magnitude here, never mind the dollar amount?). The economic principle at work here is that of diminishing returns. The marginal cost of abatement gets higher as the level of abatement increases. Why was the mercury criteria set where it was? The report never gives any explanation. It is clear that it is going to be expensive for society to get to this level of abatement. That does not necessarily imply, however, that it is not worth the expense. Again, a cost benefit analysis is required to answer the question of where the mercury criteria should be set, not a cost effectiveness analysis.

Life of the Permits

The recommendation of extending the life of permits from 5 to 10 years would obviously decrease regulatory uncertainty. The opportunity cost of this change would be the foregone ability to adjust the criteria as more scientific data become available on the effect of the substances within the ecosystem. This would

therefore seem to rather significantly change the institutions and incentives underlying the policy.

Political Ramifications

We suspect that the Sierra Club has more insight into the political ramifications of the report than two economists, but some perspective from the outside is often handy. DRI argues in the paper that the danger of adopting the GLI as written is that it could cause an environmental backlash when the results do not materialize as quickly or effectively as they should have. Non-point source pollution clearly has to be addressed, but the danger of holding up the GLI in order to incorporate it, or of dismantling the GLI in favor of a LAMP approach, is that the institutional development that has been accomplished and will continue to develop in the future around the GLI will be stymied.

The public does not have to be oversold on the GLI. If packaged as a first step, continued institutional development will make the implementation of a more comprehensive LAMP approach more feasible in the future. As stated earlier, the outcomes generated by an economic system are a function of the institutions that underlie them. Leverage to bring to the bargaining table with Canada, a model of intercountry cooperation to take to Mexico for negotiations regarding atmospheric deposition, these are important economic as well as political outcomes that need to be kept in mind when discussing the future of the Great Lakes Water Quality Initiative.

Broken Agreement

The Failure of the United States and Canada To Implement the Great Lakes Water Quality Agreement

September 1991

Great Lakes United

About This Report

This report was written by Great Lakes United President John Jackson and GLU Field Coordinator Karen Murphy with assistance from numerous organizations and individuals from throughout the Basin, including Lake Michigan Federation, Sierra Club, Tip O' the Mitt Watershed Council, Pollution Probe, National Wildlife Foundation, Canadian Environmental Law Association, Rawson Academy of Sciences, Atlantic States Legal Foundation, and the Great Lakes Research Consortium.

The report was edited, designed and produced by Reg Gilbert.

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Great Lakes United

Great Lakes United is a binational coalition for the conservation and protection of the Great Lakes--St. Lawrence ecosystem.

In Canada, Great Lakes United can be contacted at P.O. Box 548, Station A, Windsor, Ontario, N9A 6M6, (519) 973-7019.

In the United States, Great Lakes United can be contacted at Buffalo State College, Cassety Hall, 1300 Elmwood Avenue, Buffalo, New York, 14222, (716) 886-0142.

Summary

Rhetoric about cleanup and restoration of the Great Lakes by the Federal Governments of Canada and the United States has escalated steadily for years. Action has followed far more slowly. In fact, the two Governments are breaking many of the commitments they made in a solemn international agreement--the Great Lakes Water Quality Agreement.

Toxics Management Strategy

The two Federal Governments have failed to develop a binational "toxic substances management strategy," an overall plan to reduce and eventually eliminate pollution of the Basin. The International Joint Commission first recommended the adoption of such a strategy ten years ago. It is the essence of the Great Lakes Water Quality Agreement taken as a whole. Effective cleanup of the Great Lakes cannot proceed without it.

The success of the 1970s-era phosphorous reduction program undertaken by the two Federal Governments hinged on cooperative efforts to achieve agreed-on load-reduction goals. A similar approach needs to be taken toward toxic substances.

During the past year the Federal Governments made much-heralded efforts to develop a binational strategy. Unfortunately, nothing came of them. Despite drafting several versions of a "Bilateral Pollution Prevention Strategy for the Great Lakes Basin and the St. Lawrence River," the Governments failed to agree.

Instead, each Government released its own pollution prevention strategy document. The Governments held press conferences to hail the completion of these documents in the spring of 1991, but the separate strategies were evidence of an unwillingness to act, not of progress.

Uniform Protection

The Governments have not developed uniform environmental protection standards for the Basin called for in the Agreement. Because the Great Lakes Basin is a single ecosystem, toxic chemical releases in one part often will end up affecting another. Thus, environmental protection standards should be the same throughout the Basin.

Current Government legislation, standards, and regulatory measures are not uniform. The water quality standard for PCBs, for example, varies from as high as 1000 parts per quadrillion in New York and Ontario to as little as 14 parts per quadrillion in Wisconsin.

Current Government legislation, standards and regulations are also not consistent with the principles and objectives of the Great Lakes Water Quality Agreement. In every one of its Biennial Reports over the past ten years, the International Joint Commission has pointed out these inconsistencies and urged the Governments to increase their efforts. Nonetheless, very little progress has been made.

Zero Discharge

The two Federal Governments have failed to develop a comprehensive strategy to achieve zero discharge and virtual elimination of persistent toxic substances.

One of the guiding principles of the Great Lakes Water Quality Agreement is the zero discharge and virtual elimination of persistent toxic substances into the Great Lakes-St. Lawrence River Basin. The International Joint Commission has provided ongoing direction for the

implementation of these principles through recommendations issued over the past ten years, but few of the significant recommendations have been adopted.

Research on the effects of toxic substances on fish, wildlife and human health in the Basin dictates that action to eliminate the inflow of these substances into the Great Lakes should take place immediately. Only by eliminating the discharge of persistent toxic substances--zero discharge--does it become feasible to achieve lasting clean up--virtual elimination--of toxic substances already present in the Basin.

The pollution prevention strategies released by the two Governments last spring fell far short of providing a clear road map for achieving zero discharge and virtual elimination of persistent toxic substances--neither strategy even sets zero discharge as a goal.

Basic Information

The Federal Governments have not compiled basic information and inventories critical to regulating toxic chemicals and to prioritizing regulatory actions.

For example, the Governments pledged in the Agreement that by September 30, 1989 (and biennially thereafter), they would identify and delineate Point Source Impact Zones, areas associated with significant discharges of industrial and municipal wastes and therefore warranting significant regulatory attention.

This effort is one of the prerequisites for any attempt to reduce discharges of toxic chemicals into the Basin. Three years after the agreed deadline this list has still not been compiled.

Even more behind schedule--to the point of absurdity--is the Governments' pledge to develop by January 1982 an inventory of raw materials, processes, products, byproducts, waste sources and emissions involving persistent toxic substances. This inventory is critical to the development of a binational toxics management strategy and to the evaluation of progress being made to achieve zero discharge of persistent toxic substances. No such inventory has been developed.

Contaminated Sediments

The Federal Governments have failed to develop comprehensive management programs for contaminated sediments. Although some resources and staffing have been dedicated to research on remediation technologies, other components of a comprehensive program are lagging.

For example, the Province of Ontario and the Canadian Federal Government developed draft criteria for assessing contaminated sediments. The Province released the draft criteria in 1987, but has not yet formally adopted them.

The Canadian Federal Government began developing sediment criteria in 1987. Five years later it has yet to release even draft criteria.

The U.S. Environmental Protection Agency first began developing sediment criteria in 1985. This year EPA plans to release criteria for five organic compounds and a methodology for developing criteria for metals. EPA plans to release criteria for two to five organic compounds per year. At this rate it will take between 35 and 140 years to develop criteria for the approximately 70 organic chemicals with the greatest potential for building up in the food chain. EPA has not developed a schedule for releasing criteria for metals.

Wetlands

In some areas--such as wetland protection and restoration--Government efforts are moving backwards. According to the IJC's 1991 Science Advisory Board report, approximately 70 percent of the original wetlands in the Great Lakes Basin have been lost. Under Annex 7 and Annex 13 of the Great Lakes Water Quality Agreement, the two Governments pledged to identify, preserve and, where necessary, rehabilitate threatened wetlands.

The Governments have not only failed to develop lists of threatened wetlands, but actions

are now being taken--particularly in the United States--that threaten to destroy many remaining wetlands.

A revised draft of the U.S. "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" was released in May 1991. If the revisions are adopted, it is estimated that the total wetland area protected in some states could be decreased by as much as 90 percent.

Lake Superior

The Federal Governments have failed to take action to protect Lake Superior.

Lake Superior is unique. It is the largest freshwater lake in the world, is relatively undeveloped, with huge tracts of shoreline inaccessible by road, and is accordingly relatively pristine. The International Joint Commission recognized Lake Superior's special character and recommended in its Fifth Biennial Report that the two Governments designate Lake Superior as a demonstration area where "no point source discharge of any persistent toxic substance will be permitted."

The only action the Governments have taken to implement this recommendation is to set up a multigovernment task force and multi-stakeholder committee to discuss it.

Fearing the amount of additional pollution that could be permitted while a plan is being developed for Lake Superior, environmental groups requested in October 1990 that the Governments immediately place a moratorium on "any new or increased discharges of persistent toxic pollutants into Lake Superior and its tributaries." The Governments have not complied with this request.

Conclusion

The efforts required to clean up contamination of the Great Lakes Basin by persistent toxic chemicals will not be easy. Cleaning up contaminated sediments, combined sewer overflows, and the myriad other problems facing the 43 Areas of Concern will require strong leadership, sustained political will and adequate funding.

These three elements are currently lacking on the part of the Federal Governments. Put simply, the Governments are failing to carry out the commitments they have made in the Great Lakes Water Quality Agreement. They are breaking their pledges to each other and to the 45 million people of the Great Lakes--St. Lawrence Basin.

As a result, the condition of the region's ecosystem and the health and well-being of the people who live in it continues to deteriorate. The United States and Canadian Federal Governments must immediately live up to the promises they have made in the Great Lakes Water Quality Agreement.

Introduction

In the late 1960s and early 1970s the Great Lakes Basin became a symbol for North America's pollution problems. Lake Erie was considered dead. Trash, dead fish, industrial waste and sewage washed up on beaches. The Cuyahoga River erupted into flames.

The United States and Canadian Federal Governments responded to the pollution crisis. The U.S. Clean Water Act and the Canada Water Act were passed in 1972. The Great Lakes Water Quality Agreement was signed by the Governments that same year. State and Provincial Governments throughout the Great Lakes Basin undertook cooperative efforts to save the lakes. Interstate pacts to reduce phosphate discharges were developed between the states bordering Lakes Michigan and Erie. The Canadian Federal Government and the Province of Ontario signed the Canada-Ontario Agreement Respecting Great Lakes Water Quality.

The central promise of the 1972 Great Lakes Water Quality Agreement was the reduction of phosphorous loadings to the Great Lakes through construction of sewage treatment plants, reduction of phosphates in detergent, and control of rural and urban runoff. Substantial progress was made under the 1972 Agreement. Lake Erie came back to life and the other Lakes were much less affected by excess algae.

But the Lakes were increasingly confronted by an even greater threat--contamination by persistent toxic chemicals. In response, the Federal Governments signed the 1978 and 1987 Great Lakes Water Quality Agreements, outstanding, precedent-setting documents that focus on contamination by toxic substances.

The 1978 Agreement pledged the two countries to work together using an ecosystem approach--one that integrates all components of air, land, water, and living organisms, including humans--to rid the Great Lakes of toxic contamination problems. The Agreement espoused a revolutionary philosophy: that the only rational approach to managing the worst pollutants is zero discharge and virtual elimination of those pollutants.

The 1987 Agreement maintained these basic principles and pledged the Governments to take action on pollution sources not covered in the 1978 Agreement, such as non-point source pollution, contaminated sediments, and airborne toxic substances.

The purpose of this report is to evaluate the Governments' progress in implementing the Agreement and to hold the Canadian and U.S. Federal Governments accountable for implementation of the Great Lakes Water Quality Agreement.

Progress made by the Governments in fulfilling their commitments can be measured in many ways. The most important is thorough assessment of the well-being of the Great Lakes Basin and all its inhabitants. Studies of Great Lakes environmental health have been carried out by a variety of scientists and research organizations. The results of their work can be seen in reports such as *Great Lakes, Great Legacy?*, a book issued jointly by the Conservation Foundation and the Institute for Research on Public Policy.

Such an assessment can also be made by simply talking with the people who live in the Great Lakes and hearing how they are affected by the quality of the Lakes. Public views and concerns have been compiled in reports such as Great Lakes United's "Unfulfilled Promises," the Assembly of First Nations' "Great Lakes Environ-

mental Impacts on Native Health" and Greenpeace's *Water for Life.*

These reports paint a disturbing picture of Great Lakes health and well-being. While some progress has been made in addressing eutrophication–excessive nutrient loading–the Great Lakes remain critically ill and in need of restoration and revitalization.

Reports such as "Blueprint for Zero," issued by the Sierra Club, and "Prescription for Healthy Great Lakes," issued jointly by the National Wildlife Federation and the Canadian Institute for Environmental Law and Policy, have provided a clear articulation of the demands of the public for action to protect the Lakes. These reports also provide a basis for review of Government progress.

In this report we have used two yardsticks for measuring Government actions. First, we compared the two Federal Governments' actions with those commitments they made in the Great Lakes Water Quality Agreement that had specific timetables attached. Secondly, we compared Government actions with the selected recommendations made by the International Joint Commission since 1978.

There are many deadlines and requirements in the Agreement and the International Joint Commission has made numerous recommendations to the two Governments over the last ten years. We focused our review on those aspects of the Agreement and those IJC recommendations whose implementation we considered the most critical to the restoration of the Great Lakes Basin ecosystem.

Ignoring Agreement Deadlines

Unfortunately, many of the commitments the U.S. and Canadian Federal Governments made when they signed the Great Lakes Water Quality Agreement have no timelines attached to them. Foremost among these is the commitment that:

"The discharge of toxic substances in toxic amounts [should] be prohibited and the discharge of any or all persistent toxic substances [should] be virtually eliminated." [Article II]

This commitment was first agreed to by the two Federal Governments in 1978. Thirteen years later, the goal of virtual elimination of persistent toxic substances is far from being realized.

In almost all cases where the two Federal Governments agreed to timetables, they have failed to meet them. In some cases, the Governments have missed deadlines for implementing important parts of the Agreement by as much as ten years.

In those cases where the Federal Governments have met Agreement deadlines, the commitments were usually of the nature of holding a meeting or producing a report. These are relatively easy commitments to fulfill, and usually have little impact on progress toward protecting or cleaning up the Great Lakes.

This ongoing history of failure to meet deadlines leads concerned citizens to question the seriousness of either Federal Government in implementing the Great Lakes Water Quality Agreement.

This section divides into two parts the significant timeline-based commitments made by the Governments in the Great Lakes Water Quality Agreement: those that have not been met at all, and those that have been met only after--sometimes long after--their deadlines have passed.

Unfulfilled Commitments

Commitments made by the two Federal Governments in the Great Lakes Water Quality Agreement that have not yet been met are, unfortunately, generally the most important commitments.

Pollution Control

By December 31, 1983: Have programs in place ("completed and in operation") to control pollution from industrial sources. These programs were to include control requirements consistent with the General and Specific Objectives of the GLWQA, including programs for the substantial elimination of discharges into the Great Lakes System of persistent toxic substances. [Article VI, 1(b)]

Nearly nine years after this deadline, government programs are far from achieving these goals. Persistent toxic substances still flow into the Great Lakes ecosystem.

Agreement Objectives

By July 1, 1988 and at least once every two years thereafter: Consider proposals to add to or revise Specific Objectives in Annex 1 and to establish action levels under Annex 12 [Persistent Toxic Substances]. [Annex 1 Supplement, 2. (a)]

The IJC had recommended 11 objectives for adoption by the two Governments. Some of these changes had been recommended by the IJC as far back as 1980. The Federal Governments were unable to agree on adoption of

these or other Specific Objectives and they did not, therefore, meet the 1988 deadline. Four years after agreeing to adopt new or revise existing Specific Objectives, no changes have been adopted by the two Governments.

Toxics Definitions

By April 1988: Agree to standard methods for assessing substances. [Annex 1 Supplement, 2. (d)]

The Binational Objectives Development Committee presented its proposed Standard Methods to the Parties on November 30, 1989. This was 20 months after the date they had agreed to. But even today--two years later still--these proposed methods have not been agreed to and adopted by the Governments.

Impact Zones

By September 30, 1989 and biennially thereafter: Identify and delineate Point Source Impact Zones. [Annex 2, 7. (a)]

Point Source Impact Zones are areas associated with significant discharges of industrial and municipal wastes. Three years after the agreed timeline, identification and listing of these areas has not been completed.

Toxics Inventory

By January 1982: Complete inventory of raw materials, processes, products, byproducts, waste sources and emissions involving persistent toxic substances. [Annex 12, 3. (a)]

Such an inventory is critical for developing toxics use reduction programs, but nine years after the deadline no such inventory has been developed and maintained.

Toxics Disposal

By 1980: Implement joint programs for disposal and transportation of hazardous materials. [Annex 12, 3. (c)]

Eleven years after the deadline, no joint disposal programs have been identified. Canada and the United States have reached agreement on approving transboundary transportation of hazardous wastes. This action does not constitute a waste disposal program, however.

Contaminated Sediments

By December 31, 1988 and biennially thereafter: Evaluate methods for quantifying transfer of contaminants and nutrients to and from bottom sediments. [Annex 14, 2. (b) (i)]

Environment Canada developed a mass balance model for contaminants in sediment and tested it for metals in the Bay of Quinte. The U.S. Army Corps of Engineers has requested an appropriation from Congress to conduct a mass balance for sediments on the U.S. side of the Great Lakes. Neither government has actually *conducted* such a mass balance.

By December 31, 1988: Develop agreed-on procedures for management of contaminated sediments. [Annex 14, 2. (b) (iv)]

Almost three years after the deadline, no management procedures have been agreed to by the two Federal Governments. Canada has developed draft guidelines for management and has proposed a sediment roundtable between Ontario and the Federal Government this winter to resolve details. U.S. EPA's Assessment and Remediation of Contaminated Sediments (ARCS) program will produce a series of management guidance documents at its conclusion in 1993.

By June 30, 1988, and biennially thereafter: Meet to design a demonstration program for management of contaminated sediments and to decide on an implementation schedule, and report progress on the implementation of this program. [Annex 14, 2. (c) (ii)]

A joint U.S./Canadian program has not been developed, although separate demonstration programs were developed in 1989 and continue to be carried out, with close consultation between the Parties and sharing of information through the U.S. ARCS program and Canada's Contaminated Sediment Remediation Program, administered through its Great Lakes Cleanup

Fund. Both Governments have limited their demonstrations to bench (laboratory) and pilot scale. Neither Government has developed a full-scale demonstration for innovative treatment technologies. Canada's only full-scale demonstration is limited to dredging technologies.

Missed Deadlines

Toxics Lists

By December 31, 1988: Compile three lists of toxic chemicals that are either present in the ecosystem or discharged or potentially discharged into the Great Lakes ecosystem. [Annex 1 Supplement, 2. (c)]

These three lists were compiled by the Binational Objectives Development Committee and submitted to the Federai Governments on November 30, 1989--eleven months later than the date agreed to. These lists still have not been formally adopted.

Phosphorous Reduction

By December 31, 1988: Meet to review effectiveness of phosphorus load reduction plans. [Annex 3 Supplement, 6.]

The review of the phosphorus control program was received at a special meeting of the two Governments in April 1990. This was 14 months after the agreed-to date.

Atmospheric Deposition

By October 1, 1988: Confer on components of the Integrated Atmospheric Deposition Network. [Annex 15, 4.]

A joint committee was established in December 1988 to begin conferring on a joint plan. A plan was finalized in March 1990, about a year and a half late.

Sediment Remediation Technologies

By December 31, 1988 and biennially thereafter: Evaluate technologies for management of contaminated sediments. [Annex 14, 2. (c) (i)]

A conference was held in October 1988 to review technologies for remediation of contaminated sediments. A joint evaluation was published under the auspices of the Sediment Subcommittee of the Water Quality Board in December 1988.

During 1991 the United States and Canadian Governments did evaluate technologies and began testing them, both separately and in consultation, at five U.S. and three Canadian Areas of Concern.

It is likely that all of the subcommittees of the IJC's Water Quality Board, including the sediment work group, will eventually be abolished. The Federal Governments need to develop new mechanisms for working together on sediment issues.

Reporting Requirements

By December 31, 1988, and biennially, thereafter: Report to the Commission progress on:

(i) implementing Remedial Action Plans and Lakewide Management Plans; [Annex 2, 7. (b)]

(ii) programs and measures to reduce the generation of contaminants; [Annex 12, 8.]

(iii) developing watershed management plans and programs to control non-point sources of pollution; [Annex 13, 5.]

(iv) implementing Annex 14 on contaminated sediments; [Annex 14, 4.]

(v) implementing Annex 15 on airborne toxic substances; [Annex 15, 6.]

(vi) implementing Annex 16 on pollution from contaminated groundwater. [Annex 16, (v).]

Of the two reports due in 1988, the Canadian report was submitted two months late, the U.S. report almost six months late. Of the reports due by the end of 1990, neither had been submitted to the International Joint Commission as of mid-September 1991.

Ignoring IJC Recommendations

Since the issuance of the First Biennial Report, the International Joint Commission has made a number of recommendations that provide direction and guidance to the Governments on the implementation of the Great Lakes Water Quality Agreement.

This section evaluates progress in implementing recommendations considered by Great Lakes United to be the most critical to the cleanup and restoration of the Basin.

Zero Discharge and Virtual Elimination

The GLWQA calls for the "virtual elimination of the discharge of persistent toxic substances." It also says that "the philosophy adopted for control of inputs of persistent toxic substances shall be zero discharge."

The IJC has repeatedly criticized the Federal Governments for failing to take this commitment seriously enough. In March 1989, for example, in its typically diplomatic language, the Commissioners concluded, "Although progress is being made [in movement towards zero discharge], the Commission feels that there is room for improvement and acceleration of effort."

The Commission's 1990 Fifth Biennial Report precisely spelled out actions that the Governments should take in accelerating movement towards zero discharge.

Binational Toxics Strategy

IJC Recommendation: "The Parties [should] complete and implement immediately a bi-national toxic substances management strategy to provide a coordinated framework for accomplishing, as soon and as fully as possible, the Agreement philosophy of zero discharge."

The IJC has made a similar recommendation in every one of its Biennial Reports. In the Addendum to the First Biennial Report in 1982, the Commission said, "The Commission is concerned, however, that there is still no overall management plan for directing and guiding the activities of the Parties and the state and provincial governments in controlling pollution in the Great Lakes System. This absence of an overall management plan, which would ideally integrate and coordinate such activities within and between jurisdictions, has often led to fragmentation of purpose, direction and resources by the relevant jurisdiction. The Commission feels that the Parties should proceed with the development of such an overall management plan for the Basin."

Almost ten years after the recommendation was first made, the Governments have still failed to heed this recommendation, which is so central to accomplishing the goals of the 1978 GLWQA.

Over the past year the Canadian and U.S. Federal Governments made much-heralded efforts towards creating a binational strategy. They even reached the point of drafting several versions of a "Bilateral Pollution Prevention Strategy for the Great Lakes Basin and the St. Lawrence River." However, the two Governments were unable to reach agreement on a binational strategy and in the spring held separate news conferences to release separate strategies.

In March 1991 the Canadian Federal Government announced a $25 million Great Lakes-St. Lawrence Pollution Prevention Initiative. The main component of the Initiative was establishment of a pollution prevention centre. Six

months later the Federal Government has still not determined where this centre is to be located and what its exact purpose will be. The announcement did not promise action, merely more multistakeholder discussions. The U.S. EPA and several state governors released a U.S.-only pollution prevention strategy at an April news conference held in Chicago. Neither of these strategies set "zero discharge" as a goal.

There is no evidence that further progress has been made towards developing a joint strategy since these initial announcements. The only joint activity in this field that the two Governments have been able to agree on is a "Binational Great Lakes/St. Lawrence River Pollution Prevention Symposium," which is being held simultaneously with the IJC Biennial Meeting in October 1991. This is only more talk--not a strategic plan.

Uniform Protection

IJC Recommendation: "The Parties and all levels of government, including local authorities, [should] co-operatively develop and implement appropriate legislation, standards and/or other regulatory measures that will give enforceable effect to the principles and objectives of the Agreement on a basin-wide basis.

"Additional review and coordination measures [should] be put into effect to ensure that other legislation and/or regulations presently in place that affect matters relevant to the Great Lakes environment -- or those enacted in the future -- are not inconsistent with Agreement Objectives.

"The measures devised pursuant to the foregoing [should] include provisions for initiation, implementation and coordination of action at all levels of government to enforce the enacted laws and/or regulations."

Government legislation, standards and regulatory measures still are not consistent with the principles and objectives of the GLWQA. In every one of its Biennial Reports over the past ten years, the IJC has pointed out these inconsistencies and urged the Governments to increase their efforts. Very little progress has been made in the 18 months since the IJC's last report.

In June 1989, the U.S. EPA, in conjunction with the eight Great Lakes States, began developing its "Great Lakes Water Quality Initiative." The initiative is intended to develop "uniform criteria and guidance governing water quality in the Great Lakes Basin" and to ensure "a more consistent approach to meeting the obligations of the United States under the GLWQA." Over two years later the Initiative is still far from completion. EPA and the Initiative Steering Committee, made up of representatives of the Great Lakes States and federal agencies, have still not approved a final draft. Although it is a good first step if approved, Initiative proposals still do not fully achieve the goals of the Great Lakes Water Quality Agreement, particularly with respect to zero discharge.

On the Canadian side, progress is even further away. In 1991 the Federal Government released new regulations designed to control discharges from pulp and paper mills, but it did not address the control of organochlorines. Pursuant to the Canadian Environmental Protection Act, a list of priority substances was released in February 1989. This list identified 44 substances that must be assessed. If the substances are found to be harmful, they must be regulated. According to the Auditor General's March 1990 report, assessment had been completed for only dioxins and furans.

The Federal Government says that primary responsibility for controlling discharges lies with the Provincial Governments. However, the Ontario government does not have enforceable water quality standards for persistent toxics. No new control regulations have been issued under Ontario's much-vaunted Municipal-Industrial Strategy for Abatement (MISA), which was launched five years ago with the aim of achieving the GLWQA's goal of "virtual elimination of persistent toxic substances."

In February, Ontario's Environment Minister Ruth Grier expressed her "extreme concern" about levels of dioxins and furans found in the discharge from 27 pulp and paper mills in Ontario, but no actions have been taken by the Provincial Government to strengthen controls on these mills.

Reverse Onus

IJC Recommendation: "The Parties [should] strengthen the principle of reverse onus in policies and programs concerned with the introduction of new chemicals, through appropriate legislation and/or regulations that include mandatory pretesting prior to approval for production and use."

Neither Federal Government has strengthened provisions to enforce the reverse onus principle since this recommendation from the Commission in April 1990. The burden of proof for demonstrating the harm of chemicals still remains primarily on those who are impacted.

Critical Pollutants

IJC Recommendation: "The Parties, in their next biennial reports to the Commission pursuant to Annex 12 [should]:

> *"report on the extent to which discharges of 11 critical pollutants...have been explicitly considered in the issuance of National Pollutant Discharge Elimination System permits and control orders.*
>
> *"assure the Commission and the public that no municipal, industrial or combined sewer overflow discharges of these substances are or will be permitted.*
>
> *"assess and report on the extent to which these 11 substances are used, stored and released in the basin by nonpoint rural and urban sources, including landfills and groundwater, and the measures being taken to prevent their further release into the Great Lakes from these sources.*
>
> *"report on the extent to which monitoring is in place to confirm that discharges of these chemicals are not occurring."*

These reports, which were due on December 31, 1990, had not been delivered to the Commission by mid-September 1991. It is clear, however, that the two Governments will not be able to report that they have achieved the goals laid out here. For example, the 11 critical pollutants continue to be discharged from permitted facilities. The request for an inventory of use, storage and release of these substances is simply a repeated request for the Governments to create an inventory that they had promised to set up by January 1982–almost ten years ago.

Persistent Toxics

IJC Recommendation: "Target dates for the staged reduction and elimination of these substances [persistent toxic substances] should be set in the very near future and strictly enforced by incorporating them into appropriate parts of the legislative program discussed below."

In the past year the two Federal Governments have made little progress toward setting target dates. The U.S. Government has set up its "33/50" program, by which the releases of 17 pollutants are to be reduced by 50 percent by 1995. The program has three major flaws:

> Of the 17 targeted pollutants only two are on the IJC's list of 11 critical pollutants. The 17 pollutants were chosen on a nationwide basis and do not, therefore, address the persistent bioaccumulative chemicals of major concern in the Great Lakes.
>
> The program calls for a 50 percent reduction of *emissions* as opposed to *use*. This means that a company could send these 17 chemicals to a sham recycling operation for incineration and claim it had reduced emissions, even though overall reductions in emissions and in the use of the chemicals would not have been achieved.
>
> The reduction goals for this program are only 50 percent of current levels, even though the U.S.-signed GLWQA calls for zero discharge of persistent toxic substances.

As for the Canadian Government, it has failed to set any targets for reductions in the use or release of persistent toxic substances.

Lake Superior

IJC Recommendation: "The Parties [should] desig-

nate Lake Superior as a demonstration area where no point source discharge of any persistent substance will be permitted. This recommendation should not prejudice or delay the implementation of our other recommendations."

The public fully supported this recommendation to protect and clean up the most pristine of the Great Lakes. In the past 18 months the only action taken to implement this recommendation is that the Federal Governments set up the U.S.-Canadian Lake Superior Task Force in May 1991 to develop a Lake Superior Initiative. A Stakeholder Advisory Committee has now been set up. No time frame for development and implementation of the Initiative has been set.

Fearing the amount of additional pollution that could be permitted while a plan is being developed for Lake Superior, environmental groups requested in October 1990 that the Governments immediately place "a moratorium on any new or increased discharges of persistent toxic pollutants into Lake Superior or its tributaries."

The Governments have not complied with this very reasonable request--one that asks only that the Governments act to prevent a *worsening* of existing conditions in the international treasure that is Lake Superior. In two instances where major new sources of pollutants to Lake Superior were proposed, citizen action--not government action--led the pulp and paper companies to withdraw their proposals.

Human Health

The IJC Commissioners were alarmed by the scientific evidence of pervasive health effects on wildlife and people living in the Great Lakes Basin. They stated, "What our generation has failed to realize is that, what we are doing to the Great Lakes, we are doing to ourselves and to our children." It was on the basis of this major concern that the Commissioners made many of the IJC's recommendations on control of persistent toxic substances in the Basin.

The Commissioners also recommended substantial further study on health effects. They stressed, however, that this research should not become the basis for delaying control actions: "The Commission concludes that sufficient data exist to mandate actions that would prevent the continued manufacture of, and human exposure to, persistent toxic substances and to promote remediation of areas contaminated by these substances."

IJC Recommendation: "The Parties [should] sponsor and fund research projects to:

> *"replicate and expand on studies which demonstrate relationships between chemical exposure and human health in the Great Lakes Basin and elsewhere;*
>
> *"identify other exposed populations and biological species and investigate the effects of chemical exposures on them."*

The Canadian Government's Department of Health and Welfare is undertaking considerable research in line with the work requested by the IJC. In January 1990, the five-year $20-million "Great Lakes Health Effects Program" was set up. Research projects in that program include studies of the health effects of particular chemicals and mixes of chemicals, studies of reproductive and multi-generational effects of chemicals, and studies of two populations particularly at risk--the First Nations, and non-native sports anglers.

In fiscal year 1991, the U.S. allocated $3 million to studythe health effects of water pollutants in the Great Lakes.

Remedial Action Plans

The International Joint Commission's Water Quality Board has listed and reported on conditions in the Areas of Concern since the Board's 1973 report. In a 1985 report, the Board formally recommended that a Remedial Action Plan process be adopted and developed for each Area of Concern. The report contained a table summarizing the Governments' assessment of when Remedial Action Plans (RAPs) would be drawn up. All forty-two plans were to have been written, although not fully implemented, by December 1986. As of September 1991, only

10 Stage II RAPs--plans for cleanup implementation--have been submitted to the International Joint Commission.

Recognizing the difficulties in developing and implementing Remedial Action Plans, the IJC in its Fourth Biennial Report made the recommendation that:

Timetables

IJC Recommendation: "The Parties [should] ensure that each of the jurisdictions establish appropriate timetables to develop Remedial Action Plans in accordance with the requirements of Annex 2 and identify achievable intermediate goals or milestones as tangible measures of progress."

In response to mounting public pressure and inaction on the part of the Environmental Protection Agency, in 1990 the United States Congress passed the Great Lakes Critical Programs Act, which established specific timelines for the completion of RAPs. All U.S. RAPs are to be submitted to the Environmental Protection Agency by June 30, 1991, to the International Joint Commission by January 1, 1992, and incorporated into State water quality plans by January 1, 1993. For the binational RAPs the U.S. is to cooperate with Canada to ensure that the RAPs are submitted to the IJC by June 30, 1991 and finalized by January 1, 1993.

Needless to say, these goals are not being met. Two months after the deadline for submission of U.S. RAPs to the EPA, and with only three months before the deadline for submission to the IJC, only 10 completed RAPs have been submitted to either organization. Completed RAPs are those that have worked through both Stage I (assessment of problems) and Stage II (assessment of needed cleanup measures) of the RAP process.

Nine of the 10 completed RAPs did not fulfill the IJC's requirements for Stage I and Stage II documents. Only three of the Stage II RAPs developed timelines for the implementation of remedial actions. Resources committed to implement cleanup were minimal to nonexistent. One of the RAPs identified the remedial actions as only proposals; three did not recommend any specific remedial actions beyond studies and monitoring.

The Canada-Ontario RAP Steering Committee has developed a schedule for the submission of Stage I and Stage II RAPs to the Internatinal Joint Commision--"subject to periodic review and change." The submission dates for Stage II RAPs range from the fourth quarter of 1991 to the fourth quarter of 1992; there are no timelines for the St. Mary's, Detroit and St. Clair Rivers RAPs.

Although listed as Areas of Concern by the Water Quality Board since 1987, New York's Eighteen Mile Creek and Ohio's Black River have made almost no progress toward assessment and cleanup. As yet no action has been taken to begin the remedial action plan process for Eighteen Mile Creek. The RAP process for the Black River has just been started.

Listing/Delisting

IJC Recommendation: "The Parties, in cooperation with the jurisdictions, [should]:

> *"develop procedures for listing and delisting Areas of Concern, and for measuring progress with respect to restoring Areas of Concern."*

In 1989 the International Joint Commission developed draft listing/delisting criteria and procedures to be used by the Commission to review Remedial Action Plans. The Commission formally adopted these criteria in 1991. The listing/delisting criteria developed by the International Joint Commission represent a good basis for ensuring uniform evaluation of RAPs.

The two Federal Governments have not formally and jointly established procedures and criteria for listing/delisting the Areas of Concern. Although the governments were involved in the development of the International Joint Commission's criteria, they have not formally adopted these criteria for their own use. Last year Canada developed its own, different "principles for delisting criteria," which have never been finalized.

New Areas of Concern

IJC Recommendation: "Identify and designate those locations in the Great Lakes Basin which qualify as Areas of Concern based on these criteria."

The Water Quality Board first identified Presque Isle Bay/Erie Harbor as a "Problem Area" in 1977. In 1990 the International Joint Commission recommended Presque Isle for designation as an Area of Concern. The U.S. Federal Government officially designated Presque Isle/Erie Harbor as an Area of Concern in January of 1991.

The Black River/Sacketts Harbor area in New York State has been reported as a problem area for ten years--but it still has not been designated as an Area of Concern. Surveillance reports conducted in 1981 and 1982 reported high loadings of heavy metals and PCBs from the Black River to Lake Ontario. Water Quality Board reports from 1983 to date have noted problems in the area. The 1983 report noted the presence of elevated levels of trace metals. In 1989 the Board reported that levels of PCBs in fish exceeded the Agreement Objective.

The Water Quality Board identified Trail Creek, Indiana, as an emerging concern in 1989. The report cited heavy metal and PCB contamination in the sediments. Concentrations of these materials exceeded EPA guidelines. Water column concentrations of cadmium, copper, mercury, and zinc exceeded Agreement Objectives. EPA has reported levels of PCBs in fish that exceed Agreement Objectives and the Board of Health has issued a consumption advisory for carp. The Governments still have not designated Trail Creek as an Area of Concern.

The Water Quality Board has also reported elevated levels of PCBs in fish from the St. Joseph River (Benton Harbor) in Michigan. No further action has been taken to designate the region as an Area of Concern.

RAP Revisions

IJC Recommendation: "The responsible Parties and jurisdictions [should] revise all RAPs that the Commission has found do not meet Stage I requirements."

Of the 19 Remedial Action Plans reviewed by the International Joint Commission as of June 1991, only 6 have met the requirements for a Stage I document. Three other remedial action plans met Stage I requirements with respect to some problems.

Neither Government has developed timelines for the revision of these Stage I documents. In several of the RAPs, the IJC has recommended including amended Stage I information as part of the Stage II document.

Public Participation

IJC Recommendation: "The jurisdictions [should] include a detailed plan for public participation as part of the Stage I submission of RAPs."

Of the 19 Remedial Action Plans reviewed by the International Joint Commission, none have included a plan for public participation. However, many of these RAPs were submitted before this recommendation was made. Seven of the nineteen RAPs submitted to the IJC--all in Michigan--had minimal public involvement: two to three public meetings held over a two-year period.

Wetlands

The quantity and quality of wetlands in the Great Lakes Basin has dramatically declined. U.S. Fish and Wildlife Service studies indicate that the Great Lakes states have lost more wetlands than other parts of the nation. Ohio, for example, has lost about 90 percent of its original wetland area; New York has lost approximately 60 percent. In southern Ontario wetland losses have exceeded 80 percent. Significant losses continue.

Recognizing the critical ecological role played by wetlands and the threat to their survival, in 1978 the U.S. and Canadian Federal Governments agreed under Annex 7 of the Great Lakes Water Quality Agreement to identify and preserve significant wetlands that were threatened by dredging and disposal activities.

Annex 13, added in the 1987 amendments, also calls for the identification, preservation, rehabilitation, and restoration of significant wetland areas threatened by urban and agricultural development and by waste disposal facilities. The International Joint Commission has echoed these concerns.

IJC Recommendation: "The Parties and jurisdictions increase efforts to rehabilitate, protect and preserve Great Lakes Coastal Wetlands and to strengthen and initiate programs which reverse wetland loss."

In the 13 years since the wetlands portion of Annex 7 was first included in the Great Lakes Water Quality Agreement, the Governments have failed to develop the promised lists of threatened wetlands.

Under Section 404 of the U.S. Clean Water Act, some regulatory protection of wetlands is provided when a wetland is threatened by dredging or filling. Despite the 404 program, the U.S. Office of Technology has reported that approximately 300,000 acres of wetlands have been lost each year since 1970.

The U.S. Federal Government recently released a revised draft of the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands." If adopted, it is estimated that in some states the total wetland area that would be protected would be decreased by 90 percent. The U.S. Fish and Wildlife Service is currently field testing the manual to obtain more concrete figures for how much wetland loss will occur. Far from reversing wetland loss, this new policy will exacerbate the problem.

Canada has failed to develop and implement regulatory programs, at the local, provincial or national levels, to preserve wetlands. In January 1991, the Federal Government released the "Federal Policy on Wetland Conservation," which stated a policy of no net loss of wetlands on Federal lands, wetland enhancement and rehabilitation, and recognition of the need for sustainable land use practices. The Canadian Federal and Provincial governments have just begun to develop the "Canadian Great Lakes Wetlands Conservation Action Plan," which will develop recommendations and strategies for wetland protection. At this time the Federal policy has not been implemented through concrete legislative or regulatory actions. The Provincial plan must be translated into action to protect wetlands.

Contaminated Sediments

Contaminated sediments are one of the most significant pollution problems facing the Great Lakes Basin. Forty-two out of forty-three Areas of Concern have contaminated sediments. Despite the fact that many of these sites have been reported as problem areas by the International Joint Commission since the early 1970s, the only criteria used to regulate contaminated sediments are open-water dredge disposal criteria developed in the late 1970s.

IJC Recommendation: "The Commission strongly recommends that the Parties direct increased research priority to the knowledge gaps inhibiting the management of sediments in the Great Lakes system."

Both Governments have begun pilot programs to evaluate various treatment technologies for the remediation of contaminated sediments. The United States established the Assessment and Remediation (ARCS) program under Section 118 in the 1987 amendments to the U.S. Clean Water Act. The ARCS program is a five-year study and demonstration effort to investigate technologies for sediment removal and remediation.

Canada established the Contaminated Sediments Remediation Program through the $125-million Great Lakes Cleanup Fund. A portion of the money from this fund is to go towards sediment remediation demonstration programs.

During 1991 both governments evaluated technologies and began testing them separately and in consultation at five U.S. and three Canadian sites. Both Countries have limited their demonstrations to bench- (laboratory) and pilot-scale levels. Neither has developed a full-scale demonstration for innovative treatment technologies. Canada's only full-scale demonstration is limited to dredging technologies.

IJC Recommendation: "The Parties, in cooperation with the jurisdictions, [should] accelerate the development of programs related to research . . . demonstration . . . and implementation of remediation technologies. [The Parties should also] ensure that adequate resources are made available to meet the commitments."

Neither Federal Government has developed a comprehensive contaminated sediments remediation program. This would require an inventory of contaminated sediment sites, a program for sediment measurement, remediation and cleanup, a strong set of criteria and standards for sediment quality, and a source of funding.

For example, the Province of Ontario and the Canadian Federal Government developed draft criteria for assessing contaminated sediments. The Province released the draft criteria in 1987, but has not yet formally adopted them. The Canadian Federal Government began developing sediment criteria in 1987. Five years later it has yet to release even draft criteria.

The U.S. EPA first began developing sediment criteria in 1985. This year it plans to release criteria for five organic compounds and a methodology for developing criteria for metals. The agency plans to release criteria for two to five organic compounds per year. At this rate it will take between 35 and 140 years to develop criteria for the approximately 70 organic chemicals with the greatest potential for building up in the food chain. This is unacceptable. EPA has not developed a schedule for releasing criteria for metals.

Conclusion

The Canadian and U.S. Governments are failing to take the actions needed to protect and restore the health of the Great Lakes.

The Governments have failed to meet many of the most crucial timelines specified in the Agreement. Even more fundamentally, progress to restore the Great Lakes has been hampered by Government inaction and a lack of cooperation between the two Governments. The Governments have been unable to develop and implement action plans for the most basic and fundamental environmental programs.

While the Governments develop news releases to announce non-actions, evidence of the damage to the Great Lakes is mounting: cormorants born with club feet, missing eyes and no brains; bald eagles unable to reproduce; fish populations ridden with tumors; and children with behavioral abnormalities, below-normal memory function, and lower IQs.

We are witnessing a slow destruction of the Great Lakes Basin ecosystem. In order to arrest this process, governments must display the leadership and will power required to prevent new contamination of the Basin ecosystem and to act to restore it.

The public and the International Joint Commission have provided ample guidance to the Governments regarding the actions needed to save the Lakes. The health of the Great Lakes--St. Lawrence River Basin and its inhabitants depend on aggressive action now.

STATE OF NEW YORK
EXECUTIVE CHAMBER
ALBANY 12224

MARIO M. CUOMO
GOVERNOR

April 25, 1994

Dear Administrator Browner:

Last fall, I joined with other Great Lakes governors to express my concerns over the EPA Great Lakes Water Quality Guidance. In response to those and other comments, your staff has been meeting with representatives of state environmental departments to clarify our concerns and to make suggestions on how to make this initiative work without imposing significant economic hardships on this region. I appreciate the outstanding effort you and your staff have made to solicit input from the Great Lakes States.

As you are aware, a number of studies have estimated the economic cost of complying with the GL Water Quality Guidance, including the Council of Great Lakes Governors' study which assessed direct compliance costs at between $700 million and $2 billion per year. Getting precise cost numbers, however, is less important than the formulation of workable guidance that will result in environmental improvement and avoid economic dislocation.

I want to emphasize that substantial agreement exists among businesses, municipalities and New York State's Department of Environmental Conservation on a number of GL Water Quality Guidance issues. Areas of agreement include:

> Guidance vs. Regulation. The GL Water Quality Guidance should be released as guidance and not regulation. It would be difficult and burdensome administratively to "shoehorn" some of our current water programs into this proposed regulation. As you know, New York's water quality regulations are quite stringent, and superimposing the GL Water Quality Guidance over them will add to the administrative workload without necessarily leading to improved water quality.

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- Intake Credits. Final guidance should reflect the principle that dischargers should be responsible for their own pollution only. We share industry's strong concern that this principle be incorporated in the proposed guidance.

- Levels of Detection. Both regulators and dischargers are extremely concerned about a regulatory scenario that requires enforcement of water quality standards below levels of detection. Such standards would be impossible to either enforce or to comply with.

- Antidegradation. I agree that the objectives of the antidegradation policy as proposed in the GL Water Quality Guidance are appropriate in some situations, especially as a tool in controlling persistent toxics. However, I encourage you to narrow the scope of the guidance to enhance its implementation by both government regulators and dischargers.

Thus, significant consensus exists relative to many issues associated with the proposed Great Lakes Water Quality Guidance. We are prepared to continue working with you toward revising and improving the proposed guidance in a way that achieves both environmental and economic objectives.

Sincerely,

Marie H. Brown

Honorable Carol Browner
Administrator
United States Environmental
Protection Agency
401 M Street, N.W.
Washington, D.C. 20515

TOMMY G. THOMPSON

Governor
State of Wisconsin

March 14, 1994

The Honorable Thomas Petri
U.S. Representative
2262 Rayburn House Building
Washington, DC 20515-4906

Dear Representative Petri:

I strongly urge your support for inclusion in the final Clean Water reauthorization bill, language making clear EPA's authority and obligation to adjust any effluent limitation for the level of background concentration of pollution in the receiving waters of a source when deriving limits for discharges. This, as you know, has been referred to as the intake credit issue.

Implementation of the Great Lakes Initiative in its current draft could cost Wisconsin municipalities along the Great Lakes $1.2 billion in initial, up-front costs and as much as $200 million yearly in operational and maintenance costs. Wisconsin industries would likely be placed at a competitive disadvantage in national markets and forced to spend millions of dollars to comply with the GLI's mandates.

The consulting firm DRI/McGraw-Hill recently completed an analysis of the Great Lakes Initiative for the Council of Great Lakes Governors. In their report, DRI/McGraw-Hill determined that a failure by the EPA to provide an adequate intake credit would be responsible for over 30 percent of the costs of implementing the program without any meaningful offsetting environmental benefits. In light of this, all eight Great Lakes Governors highlighted the need to provide an intake credit in a joint letter on the Great Lakes Initiative that was presented to the EPA.

Regrettably, the EPA has now raised the question as to whether they have the legal authority under the current Clean Water Act to provide for an intake credit consistent with the desires of all eight Great Lake states. While many believe that the EPA does have the authority to provide for an intake credit, and that the agency's position is contrary to their previous policy, the fact remains that the EPA has raised the issue. Accordingly, the matter must be clarified.

I should note that this issue is of importance to communities beyond the Great Lakes. The agency has indicated previously that it views the GLI as a model for nationwide environmental regulations. Applied statewide, the current cost estimates for industries and municipalities to implement the GLI would have to be multiplied many times.

Room 115 East, State Capitol, P.O. Box 7863, Madison, Wisconsin 53707 • (608) 266-1212 • FAX (608) 267-8983

Representative Petri
March 14, 1994
Page Two

As Wisconsin's representative on the Water Resources Subcommittee of the House Public Works and Transportation Committee, you can make a difference on this critical issue. Your leadership in getting an intake credit provision in the bill would be greatly appreciated.

Sincerely,

Tommy

TOMMY G. THOMPSON
Governor

TGT/dkt

STATE OF OHIO
OFFICE OF THE GOVERNOR
COLUMBUS 43266-0601

GEORGE V. VOINOVICH
GOVERNOR

March 23, 1994

The Honorable Solomon Ortiz
Chairman, Subcommittee on Oceanography
House Merchant Marine and Fisheries Committee
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Ortiz:

As Chairman of the Council of Great Lakes Governors, I am very upset about the economic impact that the Great Lakes Water Quality Initiative will have on the competitiveness of this region. U.S. EPA is currently reviewing public comments on this proposed program and I want you to understand my position on this issue because it could have a tremendous impact on the Great Lakes states and our ability to compete.

As the program currently stands, municipalities and industries across the Great Lakes states will face millions of dollars in additional treatment costs in order to comply with the proposed rules. An independent study conducted for the Council of Great Lakes Governors estimated direct compliance costs between $500 million and $2.3 billion. The study also found that some provisions of this initiative create significant costs without contributing to meaningful toxic reductions.

The federal government and U.S. EPA cannot expect the cities and industries of the Great Lakes to spend millions of capital dollars when the results will demonstrate little environmental improvement. It is important to note that municipalities and industries account for less than half of the pollutants entering the Lakes.

While I wholeheartedly support the goal of reducing toxics in the Great Lakes, it is essential that our investments be on a program that works. The Great Lakes Governors want to fix the toxics problem, not just spend money on it. The Great Lakes Governors have submitted proposed revisions to the proposal which will lower the cost of the initiative by 50 to 60 percent without lessening significant environmental gains.

Under its present format, the Great Lakes Water Quality Initiative will not generate significant improvement in the lakes and will create tremendous financial hardship on these states. Thank you for this opportunity to outline my concerns about this initiative.

Sincerely,

George V. Voinovich

George V. Voinovich
Governor

GEORGE V. VOINOVICH
GOVERNOR

STATE OF OHIO
OFFICE OF THE GOVERNOR
COLUMBUS 43266-0801

April 5, 1994

The Honorable Douglas Applegate
U.S. House of Representatives
2183 Rayburn House Office Building
Washington, DC 20515

Dear Congressman Applegate:

Thank you for your personal interest and consideration of the State's concerns over Clean Water Act reauthorization. I understand my Washington Office and representatives from Ohio EPA met with you and your staff earlier this month to discuss Ohio's priorities for this legislation.

In addition to those priorities, I would like to bring to your attention several issues concerning the Great Lakes Water Quality Initiative that should be resolved through CWA reauthorization.

I am deeply concerned about the economic impact the GLI will have on the competitiveness of the region. As currently proposed, municipalities and industries across the Great Lakes states will face millions of dollars in additional treatment costs in order to comply with the proposed rules. An independent study conducted for the Council of Great Lakes Governors estimated direct compliance costs between $500 million and $2.3 billion. The study also found that some provisions of this initiative create *significant* costs without contributing to meaningful toxic reductions.

One issue that should be addressed during CWA reauthorization is intake credits. Water coming into regulated facilities often contains quantities of pollutants. Under GLI, facilities would be required to remove substances from their wastewater which came from their intake water not from the facility. In addition, the proposal would impose more treatment requirements even when a regulated facility makes its discharge cleaner than the intake water.

According to the study commissioned by the Council of Great Lakes Governors, the intake issue alone would account for additional compliance costs exceeding $700 million per year, with minimal environmental benefits. The Clean Water Act should authorize U.S. EPA to use intake credits when setting discharge limits, preserving the principle that dischargers are only held responsible for pollutants they add to their discharges.

The Honorable Douglas Applegate
April 5, 1994
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Secondly, Congress' intent under the Great Lakes Critical Programs Act of 1990 was for U.S. EPA to issue guidance concerning water quality procedures and then require states to adopt requirements consistent with that guidance. However, EPA has strayed from this intent by indicating that a state program would be considered acceptable only if it is "equal to or more stringent than" the EPA-specified provisions.

States should be required to consider the EPA guidance in promulgating their own water quality programs, but also should be allowed to adopt programs that are substantially different from the EPA guidance if there are adequate, scientifically defensible reasons for doing so.

I am committed to reducing toxics in the Great Lakes through a program that works, but believe the proposed initiative would not result in significant environmental impact and would bear a great financial burden to municipalities and industries. I urge you to address these concerns through Clean Water Act reauthorization

Thank you for your personal consideration of this very important matter.

Sincerely,

George

George V. Voinovich
Governor

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